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The Farmer's Digest

Volume 10 January, 1947 Number 8

Farm-Size Crop Driers

Condensed from Capper's Farmer

M. N. Beeler

HEATED air driers for grains and forage adapted to individual farms, are on the way. Successful demonstrations have been held in Texas. Others are reported from California, Minnesota, North Dakota and Ohio.

Development of equipment was spurred by demand of farmers in regions of frequent rainfall and high humidity. Field curing of hay is too hazardous in those sections and grain rarely is dry enough at harvest time to permit storage. Hope that such equipment could be devised was offered by big-scale commercial driers and the farmer experienced with forced air curing of hay in the mow. Operation of the equipment is made possible by availability of electric power, natural gas, Liquefied-Petroleum gas (butane or propane) or low-cost solid fuels.

The Texas equipment is an outgrowth of a search, which started in 1925, for jobs that could build up rural electric-line loads.

A few duct systems of the Tennessee type for mow curing of hay have been installed in the state. But for unheated air the hay should not contain more than 50 per cent moisture and preferably 35 to 40 per cent. Curing to that stage is often impossible in the Gulf Coast region and inland as far as frequent rainfall and high humidity penetrate. Sometimes hay lies in the field 3 weeks without drying to 50 per cent moisture and by that time it is likely to be worthless. Because of that difficulty, many farmers abandoned growing clovers. It wasn't practical to make them into hay. Still the land and the cattle needed legumes.

The same atmospheric conditions made forced unheated drying of grains impractical. Usually the air contains so much moisture that it will not dry binned grain

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even with prolonged blowing. Heat, therefore, seemed the logical solution to both problems.

Texas A. & M. agricultural engineers, directed by P. T. Montfort, after encouraging preliminary tests, made a small unit of farm-size capacity, called a panel drier. It consisted of 2 columns for the grain with an air chamber between. Sides of grain compartments were covered with screening reinforced with ½-inch hardware cloth stretched on 2 by 4 frames. Dimensions of the grain columns were 6 feet long, 9 feet high and 10 inches thick. A low-pressure box burner capable of supplying 750,000 b.t.u. an hour on butane gas at 8-ounce pressure was used to heat the air to 180 degrees. A 24-inch forward curve centrifugal fan operated by a 5-horse motor was installed for blowing. Air forced into the middle chamber could escape only thru the columns of grain. Capacity of the unit was 5,500 pounds.

Under demonstration this unit reduced moisture in milo and hegari from 20 to 13 per cent in 90 minutes at a fuel and electricity cost of 30 cents a ton. Capacity of the drier, under operating conditions, averaged about 2,000 pounds an hour with time out for loading and unloading the columns. Three such outfits, 2 experimental and 1 commercial, operated in 1945. Two steel companies in Texas obtained plans for the driers with intention of building them for the farm trade.

Cost of the experimental units Montfort estimated at $550 to $600. For an additional $75 to $200, he said, the unit could be equipped for mechanical handling of grain. This will save labor and increase the capacity of the unit because less time will be required for loading and unloading.

As the grain drying progressed, demand for forage-drying equipment became more insistent. Then engineers conceived the notion of developing equipment which could be used for either hay or grain.

A. L. Carter, Waller county, installed a drier in a half-cylinder barn, 40-feet wide and 100 feet long. It occupies a space 16 feet wide along one side. The main tunnel is along the side wall underground, made of concrete, and with air outlets to laterals located in the top, flush with the surface of the concrete floor of the barn. Fan and burner are located half way of the long side so that heated air can be delivered alternately to each end of the system. This arrangement permits unloading or loading one side of the drier while the other is in operation. Cost of the installation including fan, burner, controls, motor and duct system was about $1,000.

With this unit Carter dried freshly cut alfalfa hay, chopped to 2½-inch lengths, without precuring in the field. The moisture content was 78 to 80 per cent and the chopped hay was spread over the system to a depth of 4½ feet, Air heated to 170 degrees was forced thru the hay at the rate of 25 cubic feet a minute per square foot of floor space. Moisture content was reduced to 7 per cent in 36 hours. The hay was a bright green color at the end of the drying period. Analysis showed 19½ per cent protein; 140 parts carotene (vitamin A carrier) per million, compared with 20 to 25 parts in the better grades of field-cured hay. Fuel and power cost for reducing the moisture from 78 to 7 per cent was $7 a ton. That would be considered reasonable for such quality by a dairyman who might otherwise lose his entire crop to bad weather or have the quality reduced seriously.

Carter also used the equipment for drying chopped hegari. The crop was bound, chopped to 1½-inch lengths with an ensilage cutter. Moisture was reduced from 72 per cent to 8.3 in 92 hours at a fuel and power cost of $2.42 a ton for the dry forage.

He also dried peanuts. As nuts are dug they contain 35 to 40 per cent moisture. They must be dried to 7 per cent. Normally they are cured to 13 or 15 per cent, threshed, bagged and dried under shelter in the sacks by natural methods. Dews, rain, humidity prolong the process. Sacks may be carried out to sun in daytime, but must be put back into the barn at night. It is an expensive and laborious job.

Carter threshed his peanuts at the usual field-curing stage but completed curing in his drier. Sacks were placed 4 deep over the laterals. Air at 120 degrees, to avoid scorched flavor, was forced thru the system at a rate of 20 feet a minute per square foot of floor space. Cost for drying was 35 cents a ton. Laborsaving and loss elimination, he estimated, amounted to $50 a ton. On this basis he realized an additional $7,500 on his crop of 300,000 pounds. He dried an equal quantity for neighbors.

After T. C. Scruggs, Galveston county, had tried a mow hay drier in 1944, he installed a larger unit in a 20 by 100-foot barn. The new system cost $500. Last year he bound sweet Sudan hay, put it in the drier within 24 hours when moisture content was 70 per cent, reduced it with heated air to 16 per cent at a cost of $4.92 a ton. He also used the drier to finish curing 13 tons of baled alfalfa hay. Moisture content as the hay came from the press was 35 per cent. It was dried to 16 per cent,

with 83-degree air and average humidity of 54 per cent, during the sunshine hours of a 15-day period. Cost totaled 42 cents a ton.

With an installation designed only for hay, W. A. Frasier, Harris county, proposed to make modifications that would enable him to dry rice, grain sorghums and peanuts. The drier occupies a 20- by 50-foot section in a half-cylinder sheet metal barn that is 40 by 80 feet. Cost of the unit without fuel tank and some farm labor used in installation was $410.38. He had used it for drying peanut hay of 34 to 65 per cent moisture to a uniform content of 11 per cent at a power and fuel cost of $2.67 a ton. Similarly he had dried hegari bundles from 52.7 per cent to 22.5 per cent moisture for $1.77 a ton of dry roughage.

In modifying the installation to dry grains, Frasier laid a floor over the laterals, which had been of 1 by 8's with a 1 by 12 on top and so were strong enough to serve as joists. Ends of the laterals were boxed tight and holes 12 by 24 inches were provided in the floor above them. These openings would offer the only escape for warm air driven into the systems. Their size was about a third the area of a sack of rice laid flat on its side. A total of 127 was provided in the 20- by 50-foot floor. Bags of rice laid over the holes should be dried by passage of warm air.

Frasier uses a combine in rice harvest. The grain contains 18 to 22 per cent moisture as it goes into the bags. That is 5 to 9 per cent too high for safe storage, so the rice must be dried. Bags hold about a barrel.

For the trial run only 51 sacks were available. Remaining openings were plugged. Excessive heat will check the kernels. So temperature of the forced air was regulated to give 105 degrees as it came under the sacks. This is the same temperature used by commercial driers. In 7 hours and 50 minutes, with the sacks turned once during that time, the moisture content of the rice was reduced to 13.1 per cent. Fuel and power cost was 6.1 cents a barrel. Commercial driers charge 50 to 60 cents.

In the second run 55 sacks were dried in 8 hours and 20 minutes at a cost of 5.7 cents a barrel.

In a number of trials the Texas investigators were unable to get satisfactory drying of grain with unheated air. The fire hazard in artificial drying of farm crops is obvious. In all the test installations, engineers provided safety controls which are adequate. Total cost of the complete automatic protective system ranged from $25 to $30.

Soil Structure is Key to Yield

Condensed from Successful Farming

Robert E. Yoder

Ohio Agricultural Experiment Station

In less than two centuries, a freedom-loving group of pioneers—migrating from a decaying Europe to a new continent rich in land resources—has developed a civilization with the highest standards of living in history. In the process, however, natural resources, *including soils*, have been exploited and, in many cases, wasted at a high rate.

The desire to take care of land was not great when it seemed that endless tracts of rich soils remained unused. When we consider that most of the land of the Cornbelt was brought into cultivation as recently as the last hundred years, it is not surprising that even today many people are indifferent to the lot of the farmer and to the condition of his land.

The basic necessities of life—food, clothing, and shelter—are derived primarily from the soil. We can continue to maintain our present high standard of living only as long as our soil resources remain sufficiently good to permit an ever-shrinking agricultural population to produce the food supply required by the masses of city dwellers. Every American, therefore, should be intensely interested in what is happening to our land resources, be he farmer, businessman, or industrial worker. Those soil resources are the very foundation of our civilization and our way of living.

No farmer can make a living on worn-out soil. For both personal and national self-preservation, we *must* shift from the highly wasteful farming required during the war to balanced systems of land use that can be truly called conservation farming.

Of course, such things as climate, topography, and soil texture set limits on what each of us can do with a given type of soil. You must *know your land.* But you can change the productivity of your soil thru good or poor management. For good soil management watch:

(a) Soil organic matter supply (humus)
(b) Plant nutrient level (fertility)
(c) Soil structure status (tilth)

Reprinted by permission from Successful Farming, Des Moines, Iowa, Nov., 1946

(d) Depth of arable soil (erosion)

These things are closely related and depend on one another. They are "hen and egg" types of problems; overlooking any one of them may cancel efforts to control the others.

Of those four soil-management problems, certainly that of keeping soil in good tilth is the most neglected.

Recent research work in soil and water conservation has clearly shown that both the capacity of soil to absorb or soak up water, and its ability to resist erosion, are determined to a large measure by its structure. And in recent years an increasing number of farmers are learning, also, that soil tilth largely determines the effectiveness of commercial fertilizers.

In addition to plant food supply, the following soil conditions influence plant growth: soil water supply, soil air supply, soil temperature, and the volume of the soil that may be penetrated by plant roots. It takes little imagination to realize that all of these things are altered by changes in soil structure. Tilth is a blanket term used to describe physical conditions of soil that determine its degree of fitness for plant growth and development.

The ideal state of tilth or structural condition should: (a) permit easy intake and good holding of rainfall; (b) provide a plentiful soil air supply; (c) cut down competition between air and water for the pore-space volume; (d) offer least resistance to roots; (e) make easy the placement and coverage of seeds, manure, and crop residues; and (f) promote soil organism activity and the release of plant foods. This is quite a complicated set of requirements. And that's just why structure of your soils is important to your crop yields!

The structural capacity of different kinds of soils is quite variable. The gray-brown silt loams which were developed under forest conditions, for instance, were never strongly granulated in comparison with the well granulated structure of the dark prairie soils which were formed under grass. When cultivated continuously, the various soils responded differently.

As virgin soils were brought into cultivation and subjected to too-heavy row cropping and repeated tillage, the supply of soil organic matter went down; the "internal architecture" of the soil lost its stability; weight per square foot increased at the expense of good open granulation. As this trend has continued, it has become more difficult to produce and keep a good state of tilth. The soils have lost their ca-

pacity both to breathe and to drain and their susceptibiltiy to erosion has increased. Both tillage and fertilizer have had to be increased to keep up yield. Land that was first drained successfully with tile drains at 5- and 6-rod spacing now drains poorly even when new tile lines are placed every 2 or 3 rods.

The time is here when many farmers must ask themselves this question: Shall I continue to struggle with land in poor tilth as a result of over-cropping to corn and soybeans—or shall I get back control over soil structure by balancing my cropping system and allowing legume-grass sods to rebuild that favorable soil condition known as good tilth? Recent results of research work on the problem of soil-structure improvement conducted by the Ohio Agricultural Experiment Station, may help in answering the question.

Fifty-six per cent of the total, increased, U. S. acreage of intertilled crops during the war was produced in five Cornbelt states, Ohio, Indiana, Illinois, Missouri, and Iowa. The farms of Michigan, Wisconsin, and Minnesota contributed over a third of the remainder. Farmers of the Cornbelt had no choice in the matter —they had the only soil resources in the United States that were still good enough to do the job *quickly*. But it's doubtful if the extra income from these big crops balanced the damage done to the soil — damage which can't be repaired.

In 11 counties of northwestern Ohio there is a two-million-acre area of rich, dark-colored soils. Most of it is as level as a floor; its original fertility approaches that of the most productive, dark-colored soils of the Cornbelt. Millions of dollars were invested in tile and open ditch drainage to bring this land into cultivation a generation ago. At that time these topsoils were rich in humus. Now comparative chemical tests of virgin and cultivated soils show that a half-century of cultivation has destroyed from one-fourth to one-third of the soil organic matter in these topsoils.

When first drained, tile lines spaced at 5- and 6-rod intervals drained the land well enough. Most subsoils in the territory are well granulated, heavy "joint clays"; tile lines rarely silt up. Thru the years, the old tile lines were split and extra lines were laid midway between them in an attempt to overcome failing soil physical conditions. This fall, tile-ditching machines were running full blast in the area. In extreme cases, completely new tile systems were being installed at spacings of two rods—and at an extra cost of over $80 per acre—one of the

penalties of too-heavy row cropping.

Research agronomists of the Ohio Agricultural Experiment Station started soil-structure experiments on Paulding clay at the Paulding County substation in 1936. Fourteen different cropping systems were started on a uniform tract of tile-drained land. The soil selected was typical of the territory with a productive capacity equal to 50 bushels of corn per acre. A more complete set of rotations for studying soil-structure problems was established at the Henry County substation in 1939; the soil type on this farm is Brookston silty-clay loam. The soils on these farms are typical of the two most extensive soil types in northwestern Ohio and similar to that found thruout the Cornbelt. Results obtained at the two locations have been very much the same. Only corn yields need be studied, because the yields of other crops in the rotations followed the same trends.

Obviously, these rotations have not run long enough to find out the yields which the different cropping systems will finally give. Nevertheless, the following analysis is interesting: 10 years ago, the land was known to have been capable of producing a 50-bushel yield of corn per acre. Using the average corn yields of the last four years as the yardstick, the changes in soil productivity brought about by *simply changing cropping systems* have been as follows:

Cropping System	Effect on Soil Productivity
Four-year rotations	
Corn-Oats-Alfalfa brome-Alfalfa brome	37% increase
Corn-Oats-Alfalfa Alfalfa	30% increase
Three-year rotations	
Corn-Oats-Sweet Clover plowed under	19% increase
Corn-Oats-Alfalfa	19% increase
Corn-Soybeans-Oats (sweet clover for green manure)	1% decrease
Two-year rotations	
Corn-Oats (sweet clover for green manure)	3% decrease
Corn-Oats	8% decrease
Corn-Oats (straw and stover removed)	38% decrease
Continuous corn	64% decrease

In addition to those startling effects on the yield, you will be interested in the looks and actions of the soils under the different cropping systems. When the land has been farmed constantly in either continuous corn or soybeans, the soil is very difficult to plow and cultivate; it is "too wet to plow before dinner and too dry after dinner." The soil clods and crusts badly; good seedbeds are rarely obtained; following the first heavy rain the soil slumps back into a solid, tight mass with water standing on top of the land for long periods following a rain—even tho tile lines beneath are open. These conditions can easily be judged by eye with the strong possibility

that where they are found the decreases listed above will also be found.

In contrast, where sod crops are used regularly, the land is easy to fit; well-granulated seedbeds can be had with the least amount of tillage. Rainfall disappears into the soil quickly and tile drains work. Loss of stand by drowning has not been experienced. Following legume-grass sods, the corn crop looks the way good, Cornbelt corn *should* look. On fertilized plots, yield increases from fertilizer are more consistent at a 70-bushel yield level than on the continuous corn plot where fertilized yields have been as low as 15 bushels per acre.

Special mention should be made of the outstanding results obtained from using two-year, alfalfa-grass sods. Apparently the tap-rooted legume punctures the sub-soil deeply and leaves behind old root channels which give rapid subsoil drainage capacity. The grass does a beautiful job of re-granulating the surface soil into little, popcorn-ball-like crumbs or aggregates that are quite able to defend themselves against the destructive forces of water. Crop roots penetrate the soil body thoroly and uniformly. The little "popcorn balls" hold plenty of water within themselves, while between them persists a multitude of small openings which permit rapid removal of excess water and a constant interchange of soil air. The soil is in good tilth. Soil in good tilth means good crop yields. Without high yields, you can't make money.

Newcastle Note

Newcastle Note — Back from Washington and a meeting of the national committee on the control of Newcastle disease, Dr. Arthur Goldhaft, director of the Vineland Poultry Laboratories, warns that cure or permanent prevention has yet to be worked out. In lieu, he suggests poultrymen observe these points, good for any disease prevention: Watch traffic in live birds, such as introduction of breeding cockerals or partially reared stock, stock from poultry markets or auctions, or by bringing home birds from poultry shows or egg laying contests. Watch contaminated crates returned from auctions or markets, contaminated feed bags, careless salesmen, poultrymen, and officials who may be transmitting disease from farm to farm.

—*N. Y. Farm and Garden*

Alfalfa Decreases Pig Death Losses

Condensed from Hog Breeder

DEATH losses in newborn pigs may be lessened by the feeding of high alfalfa meal in winter sow rations and by allowing sows and gilts free access to green pasture, according to Dr. Malcolm Beeson, Purdue University animal nutritionist.

Dr. Beeson states that a conservative estimate indicates that 20% or more of the pigs farrowed on farms, are either still-born or die within the first few days after farrowing. Every pig that dies between one to three days of age represents an approximate loss of 100 pounds of feed, if it dies at around 21 days of age, 150 pounds of feed, and death of a pig at 56 days of age results in the loss of 200 pounds of feed.

Contrary to the opinion that losses in young pigs are caused by accidental injury, current Purdue studies on about 1,000 young pigs which died or were purposely killed during the first week after farrowing, indicate that a large percentage of the deaths are caused by abnormalities at birth instead of physical injury. These pigs made little effort to escape injury.

Dr. Beeson reported that even though a sow is producing an adequate amount of milk, the pigs are not able to assimilate the milk. A majority of the pigs examined were not suffering from starvation but died on a full stomach.

Apparently feeds such as corn, protein supplements and minerals do not supply all the nutritional needs of the pig before it is born and for pig's health at birth and during suckling.

The Purdue station attacked the problem by studying feeding of the sows and gilts and found that the deficiencies may be partially prevented and the livability of the pigs improved by mixing 10 to 15% by weight of high grade alfalfa meal in winter sow rations.

In addition to the minerals, vitamins, and high quality protein supplied by the ground legumes, it has the additional value of adding fiber or bulk to the sow ration which aids materially in preventing the sows and gilts from becoming too fat and also provides a bulky diet at farrowing time.

A second and even better method of supplying these indispensable nutrients is to allow the sows and gilts free access to green

Reprinted by permission from The Hog Breeder, Chicago, Illinois, Oct., 1946

pastures. Even though pasture is not available during the entire winter pre-birth period, Purdue and also Illinois experiment stations, results indicate that sows are capable of storing certain amounts of these nutrients during pasture feeding which will aid in carrying them through the latter part of the pre-birth period when green forage is not available. However, for extra protection and insurance it is advisable to add 15% or more of high quality alfalfa meal to the sows diet after the green forage is gone.

These practices are the soundest and most economical means of increasing the efficiency of hog production, Beeson emphasized.

Sodium Fluoride Proves Best Control of Roundworms

According to the United States Department of Agriculture reports, on the control of roundworms, sodium fluoride is the most efficient drug yet found.

Under experimental conditions, treatment with sodium fluoride eliminated 95 percent of the roundworms, while other drugs were only 50 to 75 percent effective.

This drug, commonly used as a poison against household pests, has proved to be safe for pigs in the small quantities recommended.

The best treatment for pigs is the feeding of a mixture of one part of sodium fluoride, technical grade, and 99 parts dry ground feed for one day. If the pigs are not used to dry feed, give them non-medicated feed for a day or two before dosing.

It is best to use the drug only in combination with sound measures of prevention and control. Specialists recommend that swine raisers use the McLean County system of sanitation at all times.

American Hampshire Herdsman

Shipping Fever

Condensed from The Cattleman

True Davis, Jr.
(Bacteriologist)

At this time of the year many feeder cattle are being shipped from the ranges to the various stockyards, hence into the feed lots. Many a stockman, having bought very favorable looking feeder stock, has gone to bed thinking of the profit these likely looking cattle are going to bring him. Upon arising he goes to take a look at his new stock and notices several standing apart from the others and refusing to eat. Thinking this is probably due to the rigors of the trip from the stockyards to his farm, he goes on about his business for the day. The next time he looks into the feed lot, he seriously believes something is actually wrong, for now his few cattle, which had earlier refused to eat, really look sick. A watery discharge from the eyes and nose has started and saliva is frequently dripping from the mouth. Our stockman friend, at this point, wonders what could be wrong, for although the cattle had been vaccinated with hemorrhagic septicemia bacterin at the stockyards where they were purchased, they are showing every well known symptom of the dreaded disease hemorrhagic septicemia, the so called "shipping fever" or "stockyards fever."

Approximately $1,000,000 worth of livestock die each year in the United States from what is commonly known as "shipping fever" and it is estimated 80 per cent of these deaths are caused by the owners of these animals not clearly understanding the fundamental means of practical protection and the principles of immunization.

Hemorrhagic septicemia ("shipping" or "stockyards fever") is a very contagious disease affecting cattle and other livestock under various conditions and at various times of the year. The disease is usually fatal and affected animals show elevations in body temperature from 104 degrees to 108 degrees F. This disease was given the name of hemorrhagic septicemia because hemorrhages are produced in the animal's system along with a septicemia, or poisoning, of the blood. The organism responsible for this disease in cattle is Pasteurella

Reprinted by permission from The Cattleman, Fort Worth, Texas, Nov., 1946

boviseptica and is generally found in the nasal and respiratory passages of all animals. It is only when the animal's resistance is lowered, due to abnormal conditions, that this organism becomes fully virulent and the animal will contract the disease. Younger animals are usually more susceptible than older ones, particularly calves, immediately after they have been weaned. Hemorrhagic septicemia in both cattle and sheep is usually complicated by other secondary invaders such as diptheroid, staphylococcus and streptococcus infections. These secondary invaders tend to further lower the animal's resistance, making the path easier for the Pasteurella organism.

During the fall months of the year the disease is most prevalent for it is usually at this time that cattle are shipped from the grass ranges into the feed lots of the country for winter feeding. While the animal is in the process of transportation the important factors of exposure, handling, and feeding all play an important part in bringing about ideal conditions for the contraction of the disease. To keep these conditions at a minimum, it is well to see that the animals are given proper rest and are not exposed to overchilling or overheating. The practice of not watering cattle until they reach the purchaser, so advantage may be taken of an extra fill in weight, is quite detrimental because it is difficult for the animal to regain its normal condition after being without water for so long a period. Care should be taken in purchasing any animals that show excessive signs of a large water fill for it will take some time for these animals to return to normal, thereby increasing their susceptibility to the disease. Upon arrival at the final destination the animals should be given a fill of dry roughage and a normal amount of water before they are put on heavy feed. These preliminary precautions should be followed quite conscientiously in all instances where animals have been shipped through contagious areas where they may very easily contract the disease.

In the field of biological immunization against hemorrhagic septicemia there are two products that may be used to bring about immunity in an animal's system.

Hemorrhagic septicemia bacterin is the most common product used and every stockman should have a complete understanding of the merits of the product. This bacterin is made from chemically killed Pasteurella organisms and when injected into an animal's system they can do no harm to the animal. The presence of these organisms, however, does set up an active immunity in the ani-

mal's system by causing the animal to produce a number of active antibodies to combat any further introduction of these disease germs. This process takes approximately ten to fourteen days before a sufficient number of these active antibodies can be produced to make the animal immune to the disease. At any time during this fourteen day period the animal may contract the disease since there is no protection in the animal's system against such up to this time. The animal will usually die from hemorrhagic septicemia if contracted during this period, showing the usual symptoms due to the fact that the antibodies offering protection in the animal's system have not yet had a chance to be produced in sufficient numbers to prevent infection. If this bacterin is to be used in immunizing an animal, the animal should be vaccinated with this product at least ten to fourteen days before it is moved or transported through contagious areas. The animal being in a weakened condition due to transportation, lack of rest, feed and water, and probably being subjected to rough handling, is particularly susceptible to hemorrhagic septicemia at this time.

The other product used for prevention of hemorrhagic septicemia is a serum that is made from the blood of animals that have been previously hyper-immunized against the disease. This blood, when made into serum, has a large number of passive antibodies that will combat this specific disease immediately upon administration to the animal's system. In the production of this serum the blood is refined by the separation of all corpuscles, leaving only the clear amber fluid known as serum, in which is found the disease combating antibodies. A chemical preservative is added and the serum is then filtered and freed of any contaminating bacteria and tested for potency. After a satisfactory potency test the serum is bottled and ready for use. When this serum is introduced into an animal's body it immediately protects the animal from hemorrhagic septicemia, for the serum is composed of antibodies already formed to combat the disease. However, these antibodies are passive and will gradually be dissipated in the animal's system. In other words, hemorrhagic septicemia serum is only effective from two to three weeks after administration. It should be carefully brought to mind the difference between the bacterin and the serum, remembering that the bacterin will not take effect for two weeks, while the serum is good for only two weeks.

Animals being shipped long distances, or being moved through

stockyards, should by all means be vaccinated with both the serum and the bacterin. The serum protecting them while they are in transit, and the bacterin protecting them after they reach the feed lot or farm.

The serum offers protection until active antibodies are produced by immunization with the bacterin. If there is any doubt whatsoever in the stockman's mind as to whether his animals have been immunized against hemorrhagic septicemia, a liberal quantity of hemorrhagic septicemia serum should be administered. However, in the case of the stockman who has raised his own stock and does not contemplate transporting such through contagious areas the bacterin would be more desirable for it will give immunity at a much lower cost than the serum.

Anti-hemorrhagic septicemia serum is also of great importance in the treatment of livestock which have already contracted this disease. In all cases where an animal is believed to have hemorrhagic septicemia a very liberal quantity of serum should be administered immediately. The antibodies present in the serum are ready to start immediate action to combat the disease germs and the noticeable improvement in the animal's condition will come about so fast it will seem phenomenal. There are several points to keep in mind in using serum to insure successful vaccination. Anti-hemorrhagic septicemia serum is obtained from the blood of both cattle and horses previously hyper-immunized against this specific disease. Depending on which type of blood, it is known as either "bovine" or "equine" origin. The blood of horses and cattle does not have the same physiological properties and it is important to remember when vaccinating cattle that serum of "bovine" origin be used, while the "equine" origin serum should be used on horses. This may possibly be made more clear by remembering that human beings have different blood types and great care is taken before blood transfusions are given to ascertain that both types of blood are alike. It is for this reason that both "bovine" and "equine" serums are produced. Always be sure you are using the correct origin serum on an animal of the same species.

Too much serum can never be administered to an animal. It is far better, and less expensive in the long run, to vaccinate an animal with more than is needed and be certain, than to use not enough and take a chance on the animal dying.

Dairy Calves Need Good Feed and Care — Not Vitamin Pills

Condensed from Farm Research

A. A. Spielman and J. K. Loosli, Ithaca

DAIRY calves need not be deficient in vitamin A at birth, according to research findings at the Experiment Station at Ithaca. A study of vitamin requirements is being made in an attempt to reduce the 15 to 20 per cent death loss of young calves on many farms. First consideration is being given to vitamins A and D, since these are most likely to be lacking in practical rations.

Dry cows were fed rations differing greatly in their carotene and vitamin-A content for 60 days before calving. The newborn calves from the cows that received the vitamin-deficient ration had less than one-tenth of a day's supply of vitamin A. However, the calves whose dams had received high-quality hay and corn silage or pasture and a good fitting ration had 7 times more vitamin-A reserves at birth. These results emphasize the value of feeding the dry cow the best possible pasture, roughage, and grain. Calves from cows that had received 1,000,000 international units of vitamin A daily in addition to a regular dry-cow ration were born with 10 days' supply of vitamin A. Further studies are under way to determine whether it is practical to feed extra vitamin A to the pregnant cow and whether the newborn calf will benefit.

The nutrition of the calf begins at the time of implantation of the fetus in the uterus, and the results of these studies show that the feed of the pregnant cow has an appreciable effect on the health of the newborn calf.

The first source of vitamins for the calf after birth is colostrum. Recent studies at Ithaca have demonstrated that the vitamin-A potency of colostrum depends on the feed of the cow before calving. The concentration and total output of vitamin A and carotene was approximately twice as high in the colostrum from the cows fed a good-quality ration as in that from cows on a poor ration. When the good ration was supplemented with vitamin A, there was a further three-fold increase in the vitamin-A content of the colostrum.

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Although the newborn calf obtains considerable amounts of carotene in colostrum, there has been some question as to whether this carotene is used by the calf. Studies conducted during the past two years have shown that newborn calves of Guernsey as well as the other breeds use carotene to meet their vitamin-A needs.

Before the need for supplying young calves with vitamin preparations can be determined, consideration must be given to the vitamin requirements of calves and to what extent natural feeds can be expected to supply these needs. Very little is known regarding the calf's requirements for vitamins other than A and D. From studies in progress at Ithaca, it appears that 6 to 10 milligrams of carotene or 10,000 international units of vitamin A and 300 international units of vitamin D per 100 pounds of body weight are sufficient. Under winter feeding conditions with poor-quality roughage and little exposure to sunlight, it is possible that winter colostrum and milk may not always furnish optimum amounts of vitamins A and D. Where large amounts of milk are fed and best quality sun-cured roughage is not available, it is advisable to feed a calf starter containing additional vitamin D.

Because deficiencies of certain of the vitamins, A, C, and niacin, have been associated with disease, vitamin pills and tablets are being advertised as preventatives and cures for scours and allied calfhood diseases. Controlled experiments were started at Ithaca in 1942 to determine the value of supplementary vitamins for young dairy calves. To date, cases of scours have been somewhat more frequent and more severe in the group of calves that received the vitamin pills than in the control group. Since these calves were raised under better than average conditions, it was decided to test the value of vitamin pills under practical farm conditions in New York State. Fifty-five privately owned and State institution herds representing all degrees of herd management and sanitation were selected to cooperate in this study. Records obtained to date on more than 1,000 calves show that the daily administration of vitamin pills did not prevent, or hasten recovery from, scours.

It should be clearly recognized that drugs and vitamins are a poor and expensive substitute for proper feeding and management. Whole milk, best-quality hay, a good calf starter, plus liberal care and common sense will result in healthy calves.

New Uses for Cotton

Condensed from Acco Press

Bill Tipton

THE war did much to accelerate research, and new products to meet specific needs were developed speedily.

The U. S. Army Engineers needed a cotton fabric for sandbags that was rot-proof and mildew-proof. With a war to win, and jute and burlap no longer available, they wanted something that would stand up for two or three years, instead of the two or three weeks that was the normal service. So, the Southern Regional Research Laboratory staff got to work on the problem, and came up with the answer.

With our natural rubber supply cut off, and with the Office of Civilian Defense organized throughout the country, there was need for a cotton yarn that would make satisfactory fire hose, particularly for large buildings. Linen had been used successfully, but imports of this fabric were not sufficient. So, the Southern Regional Research Laboratory made the cotton fibers do new tricks, and came up with water-tight fabrics made by swelling cotton fibers.

The U. S. Navy Medical Corps, treating all types of battle casualties, called for a new surgical gauze with elasticity, particularly for securing dressings about freshly operated joints. ordinary elastic bandage wouldn't do, so once again the Southern Regional Research Laboratory applied itself to the problem, and came up with a new all-cotton bandage that was in effect a preshrunk gauze that would stretch 20 per cent. Then, since no manufacturing facility was available, the Laboratory proceeded to make 30,000 rolls of this special bandage for the Navy.

The Army wanted its cotton garments flame-proofed, so that was done. The War Production Board pointed to the rapidly decreasing pile of linters, and said that something had to be done about utilizing short staple cotton, and converting it into linters. So the Southern Regional Research Laboratory developed a cutting machine to cut cotton cheaply in large quantities to supplement linters. In other words, this cutter converted short staple cotton into artificial linters.

What is this Southern Regional Research Laboratory anyway, and how did it get started? Was

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it some new "war baby," set up for the benefit of our fighting forces? Well, the more I heard about the developments there, the more I wanted to get the whole story, so I went to New Orleans to find out.

The Southern Regional Research Laboratory at New Orleans is one of four such regional farm research laboratories authorized in 1938 by the Congress as a part of the work of the U. S. Department of Agriculture, with the objective of searching for new and wider industrial outlets and markets for agricultural commodities. The Southern Laboratory reseach projects are cotton, peanuts and sweet potatoes, and it serves the major farm producing area including Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, South Carolina, and Texas.

The other three such laboratories are the Northern Regional Research Laboratory at Peoria, Illinois, studying corn, wheat, and agricultural waste products; the Eastern Regional Laboratory at Philadelphia, studying tobacco, apples, Irish potatoes, milk products, and vegetables; and the Western Regional Research Laboratory at San Francisco, studying fruits (other than apples), vegetables, Irish potatoes, wheat, and alfalfa.

The Southern Regional Research Laboratory was officially opened on April 1, 1941, and with the beginning of our entry into World War II, converted to an intensive study of war problems before the entire staff was engaged. Much of its work during the war years was on the "hush-hush" side, but now these developments have been brought out into the open, and it makes an interesting story. With the war behind them, 309 people are now busy at the Southern Laboratory, 145 of them scientists, of professional standing, 39 are technicians or laboratory assistants of semi-professional standing, 82 are service people, and 43 are clerks.

The work of the Laboratory is divided into seven research divisions. This work is under the direction of Walter M. Scott, with Harry P. Newton as assistant director. Both Colonel Scott and Colonel Newton have recently returned from lengthy service in the U. S. Army.

When I visited the Laboratory Colonel Newton turned me over to Charles F. Goldthwait, one of the Laboratory's top researchers. He first told me about the long-term project on rot-proof and mildew-proof cotton cloth. "Ordinary soil is teeming with micro-organisms," he told me, "and a piece of untreated cloth placed in this soil will deteriorate very quickly. As a proposed solu-

tion to the problem, we carried the development of partial acetylation of cotton yarn and cloth to a point where it retained 90 per cent of its strength, and micro-organisms wouldn't eat it. At the same time, we got around the disadvantages of previous conventional treatments, such as odor, stickiness, discoloration toxicity to the user, and loss of effectiveness by leaching."

If you're of a chemical turn of mind, you'll be interested in knowing that the process depends upon a chemical reaction directly with cotton yarn, thread, or cloth which changes it to a new material. This method is a simple acetylation, with the usual acetic anhydride as the active agent, acetic acid as a diluent, and a small amount of a catalyst. The cotton is usually pre-treated with glacial acetic acid and the conditions of acetylation controlled so as to reduce any possible degradation of the cotton. The process varies with the nature of the cotton goods and the degree of acetylation desired.

While this development had an immediate war-time application, Mr. Goldthwait predicts that the peacetime uses will be even more important. "Among the many uses we can foresee for this product are for use in fish nets, marine cords and ropes for tents and farm uses, cloth for sandbags, sewing thread for paper, cotton or jute bags rot-proofed by other methods, tents, tarpaulins, awnings, seed bed covers, bags for fruits and vegetables, thread and fabrics for shoes, thread for other leading articles, outdoor furniture and sports equipment, fabrics for control of floods and soil erosion, belting hose and mechanical fabrics, and electrical insulation, particularly where subject to mildew or rotting. All of these potential uses are contingent upon the economics involved. The water softener manufacturers are particularly interested in this material, for they see a wide rural application if chemicals can be placed in a bag made of this material and placed in the unit."

Next, I asked about the water-tight fabrics made by swelling cotton fibers, Mr. Goldthwait pointed out that the method developed at the Southern Regional Research Laboratory gives heavy cotton fabrics new properties. Passage of water is resisted by increasing the swelling of fibers in the yarn, and nearly total closure of air space between yarns is possible.

The chemical treatment of cotton fibers was with commercial hydroxy ethyl ether of cellulose, soluble in caustic alkali but not soluble in water. It was readily precipitated on the yarn, and re-

swells upon wetting. This material, compared with linen for capacity for stopping the flow of water under pressure, compared effectively with equal weight of linen. When the yarn was woven, the pieces did not leak at all when clamped on a test block and submitted to water at 100 pounds pressure in direct contact with the fabric. Hoses made of this new cotton material had nozzles fastened at one end, and transmitted water pressure at 55 to 60 pounds without undue leakage.

In addition to its direct contribution to the swelling capacity of the yarn, the swelling agent has other important effects. It acts as an adhesive to hold the fibers closely together, and thus reduces the air space. It makes the yarn compress more easily, so that it beats up better and stays in place when woven. It makes possible the use of the better swelling, low-twist yarns because the adhesive effect brings their strength up to that of comparable yarns of normal twist. The treated yarn retains its strength upon wetting, and wets readily in comparison with untreated cotton. The shortage in the linen supply for fire hose did not develop, and large scale demonstrations of this swelling method have not yet been made. Additional experimentation is proceeding to make further improvements. Peacetime uses for this cotton fabric lie in the field of tents, tarpaulins, covers and rainwear.

When I asked about the new cotton gauze bandage developed for the Navy Medical Corps, Mr. Goldthwait smiled and said, "That's probably one of the most dramatic of our Laboratory developments, and one that can be pictured easily.

This semi-elastic cotton gauze bandage fabric is an outgrowth of the well-known fact that immersion in concentrated sodium hydroxide solution causes cotton to shrink, primarily because it swells the fibers. The tendency of the swelling fibers to expand within the spiral structure of the yarn in the cloth causes the yarn to shorten. This in turn causes the cloth to shrink. The shrinking or mercerizing treatment causes the yarn to expand in diameter and to become loose in construction, to shrink until the interspaces in the cloth are much smaller, and to form many crimps and kinks. As a result, the cloth stretches easily under low tension, due to straightening of the yarns and tightening of their structure, but returns elastically when released to approximately its dimensions in the shrunk form.

The elastic properties have proved very satisfactory for all around use, according to Mr. Goldthwait. "The surface irreg-

ularities, which are due to crimping and kinking, intermesh as each layer of a bandage or dressing is added, so that no layer can slip upon the others," he explained. "Thus the bandage is interlocked, does not come apart readily and also tends to stay in position."

Widely used by the Navy Medical Corps and clinicly tested in hospitals throughout the country, this new semi-elastic cotton gauze bandage is being tested for commercial production this year. You may see it one of these days as standard bandage material at the corner drugstore.

One of the interesting projects under way in the Cotton Chemical Finishing Division of the Laboratory, headed by J. D. Dean, is an inquiry into the possibilities of making low-quality, short staple cotton into osnaberg and low-cost sheeting of improved quality. Such a successful demonstration would open up new outlets for short staple cotton and prove a boon to the cotton industry. I saw several examples of osnaberg converted into slip covers, table runners, drapes, and luncheon cloths, and asked what the steps were in making ordinary osnaberg into this nicely finished material. I found that it is taken through seven steps; singeing through gas flame to burn off loose fibers; de-sizing, a chemical treatment to take out the sizing; Kier boiling under pressure to take out impurities; bleaching by peroxide treatment; mercerizing by passing the cloth through strong caustic soda solution under tension, thus getting ready for the dyeing process by giving the cloth better optical or light reflecting qualities; dyeing with fast vat-type color; finishing with a modified cellulose compound to give a durable finish. The four ounce osnaberg doesn't finish too well, but the seven ounce osnaberg, dyed blue or brown, would make excellent slip covers, drapes or luncheon cloths. I also saw some sugar bag sheeting made from seven-eighths staple cotton that made some beautifully finished cloth.

Another interesting project under way at the Southern Regional Research Laboratory is the tire cord research, with four divisions taking part in this work. It was undertaken in 1942, and has two objectives; first, to find the most satisfactory type of cotton grown in commercial quantities for use in tire cord; and second, as a long-range project, to develop improved types of cord through chemical and mechanical treatments. This research, working closely with tire manufacturers, is devoted to research into fundamental physical and chemical properties of raw cot-

ton and cotton cord as to performance and service. New equipment is being installed to make up complete tire sections, and this will speed up the tests. Persons allied with any phase of the great cotton industry should be interested in what is being done at New Orleans, and should follow the research with great interest. Out of this Laboratory have come many new uses for cotton, and the work is only beginning. We'll see many new products on store shelves in future years, things made of cotton, that owe their existence to the research work done in this Laboratory.

Air-Minded Farmers

Condensed from Farm and Ranch

J. A. Rickard

IF ANYONE doubts that the farmers and ranchers of the Southwest have become air-minded, then he should doubt no longer; the facts speak for themselves. For these people have taken to the air to plant crops, poison crickets, round up antelopes and cattle, transport plants and animals, dust orchards and fields, hunt coyotes, locate soil-erosion areas and do other conservation work, commute, buy and sell, and do various and sundry other things. To cap it all, the flying farmers have formed a number of statewide organizations, united by a national group.

To begin explaining this impressive record with crop planting, we might take the case of T. B. and C. G. Jackson, both of Galveston county, Texas. They wanted to plant 2,500 acres of rice and do it quickly. Some rice planting had already been done in water-covered fields in Arkansas, but their land was dry. They decided to use their small plane for the task.

They equipped it with a fan-like chute and converted the cockpit into a bin which would hold 500 pounds of rice. Then they started planting, taking the land by 20-foot strips and flying as low as they dared. If they had done the job with drills it would have taken weeks, but with a plane they seeded the entire acreage in five days. They harrowed in the seed to prevent birds from eating it up, and then, in due time, they reaped the harvest.

A more spectacular, but per-

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haps less successful, scheme of planting by air originated with a Californian who tried it out in 1945. Realizing that many seeds were too light to be planted by air with much success, he developed a pellet heavy enough to fall in the right spot and stay there. This pellet contained several seeds of trees, grass, grain, or whatever was to be planted. It was made of clay, vitamins, and fertilizer. When planted during or after a rain, the pellet sank into the ground, the clay dissolved, and the seeds started growing. For dry-planting, he used a lead-covered pellet containing holes and heavy enough to bury itself in the ground in spite of its hardness.

Great virtues were claimed for this method of planting. It would plant land at the rate of 20,000 acres per hour and would thus be useful on about 100 million acres of land West of the 100th meridian, said the inventor. Moreover, the cost was low on account of the speed, the certainty of germination, and the small number of men needed.

Experiments in pellet planting, encouraged by the federal government, were made near San Diego, California, and on the King Ranch in South Texas, but the results were uncertain. One defect about the scheme is the heavy weight of the pellets, compared with that of the raw seeds. This would add greatly to the shipping costs, but it was a "noble experiment."

Another interesting use for airplanes was found by some men at Elko, Nevada, in 1941. With two small open cockpit biplanes loaded with bombing materials of bran and sodium fluosilicate, they made a successful flight against hordes of crickets. They dropped this poisoned bait over moving armies of the wingless creatures, and from 70% to 95% of them died. Those left alive did little or no damage.

In some portions of the Great Plains are surviving herds of antelopes. In spite of the fact that these little animals are "the fastest things on four legs," they have been hunted and killed so ruthlessly that they are in danger of extinction.

To prevent such a calamity, conservation measures have been taken. Antelopes are kept on large ranches, where grass is good and hunters are not allowed. The antelopes get along well with cattle but not with sheep, and sometimes they have to be rounded up and even transported from place to place. Cowboys on horses have tried this, but the method is slow and costly, and sometimes unworkable.

Planes will do the rounding up nicely, though. The antelopes are

scared of the noise from the motors, and they can be herded in any desired direction by a low-flying plane with a slow speed. By this means the herd can be "drifted" into a large wire corral and from there into a smaller pen. Then they can be loaded into trucks and moved.

In somewhat the same fashion, herds of cattle or wild horses can be located and moved. They do not scare so easily as the antelopes, nor do they move so fast, but they will shy away from a low-flying plane. A skillful pilot can "ride herd" on a bunch of cattle and do the work of several cowboys on broncs.

Transportation is more commercial than agricultural as a rule, but when it comes to moving seeds, plants, or animals, the farmers and ranchers are affected. And this is being done on a large scale by air.

To illustrate, seeds have been flown from country to country and from continent to continent, and native plants have found a favorable soil in new homes. Manila hemp was taken from British Malaya to Central America, where it became a thriving crop. Twenty thousand acres were soon in cultivation, and ropes were being produced to help win the war. Seed from the rubber trees was moved from Jap-controlled Sumatra to India. High-yielding hybrid corn, long-staple cotton, and wilt-resistant wheat and rye have likewise found new homes, in or out of the United States; and live ewes and rams have been moved by air into Africa.

Coming closer to home, acorns of the cork oak have been moved from Spain to California; and chinchona (quinine) seed were smuggled out of the Jap-held Rico and planted.

In the matter of crop moving, the United Air Lines has established a fast cross-continent air transport. When it was started, their planes made the trip in eighteen hours; but before long, with larger and faster planes, they intend to reduce the time to ten or eleven hours. They are now moving a variety of fruits and vegetables at an average price of from 4 to 5 cents per pound for every 500 miles.

It is not expected that air traffic will displace rail traffic, for air rates will remain high, but some crops can be moved by air to advantage. Take tomatoes, for instance. With retail prices for them sometimes as high as 25 cents per pound, air freight is profitable. Market orders can be filled more rapidly, and riper tomatoes can be carried by air than by rail. A thriving air traffic in tomatoes has grown up between Lower Valley towns and San An-

tonio and points north, and no doubt this experience is being repeated elsewhere.

Mushrooms can also be carried profitably by air freight. About half of the nation's supply of mushrooms is grown in Kennett Square, Pennsylvania. As the life of a mushroom after being pulled is not more than 72 hours, the product can be sent only a few hundred miles by rail; but by plane the range is much greater and the market wider.

It has been proved many times that people will pay high prices to get fresh products, and in the near future there will not be very many places on earth where fast planes cannot deliver perishable goods in first-class condition.

Pan-American Airways is another pioneer in the field of crop moving. For at least ten years they have been transporting large cargoes of corn, live chicks, queen bees, and "insect commandos" to destroy such pests as the citrus black fly, the apple aphid, and the sugar-cane borer.

Crop dusting is so important as to deserve a separate story by itself, and for that task the plane is an ideal agricultural implement. It never touches the field (unless it accidentally flies too low), and it can take care of large areas quickly. It will spread fertilizer, poison weeds, and aid in pest and insect control by dusting insecticides on forests and orchards. For orchards it does a better job than does the ground duster, which cannot reach all parts of large trees so quickly or effectively.

However, air dusting has its defects and presents certain difficulties. For effective dusting, the wind must not be blowing more than 5 miles per hour, and in some regions near the sea this condition seldom occurs. Too, the pilot must be careful not to blow dust on other nearby crops or fields; if he does he may have to pay damages. He must dust early in the day while the dew is on the trees or plants.

There is danger from low flying too, for to dust effectively the plane must barely skim the top of the trees. Fog can hinder him, and rain can wash off the insecticides; even a shower can undo his work.Hillside fields are hard to dust also unless the wind is blowing gently toward the slope. The advantages of dusting outweigh the disadvantages, however, and the method is widely used, especially in the Lower Rio Grande Valley. There one can find at least a dozen licensed pilots who operate dusting planes as a regular part of their service to the public.

Turning now to another aspect of plane operations, we come to a spectactular one: coyote hunt-

ing. Coyotes reach the status of a major headache on some ranches, and in season their pelts are sometimes worth 10 to 15 dollars each. In a number of instances, old-time cowboys have been known to quit their ponies, mount to the cockpit, and go hunting.

For effective work, it is probably best that two men "ride" the plane, one to pilot and the other to shoot the animals, but one man can take shots by dropping the controls for a few seconds while shooting. After the prey has been located, the plane flies low to easy gunshot range, and the shooting begins. If a landing place is near, so much the better; if not, a nearby landing should be made and the pelts secured without delay.

In 1943 one pair of cowboys reported that they had bagged over 400 pelts during the season. The game commissioner of Oregon employed three teams of coyote-hunting flyers and found that they did more effective work than trappers. Coyote hunting is most successful in areas barely covered by sagebrush, in which the animals can be seen from the air, and it is especially effective when the ground is snow-covered.

There are some cautions to observe, say coyote hunters. Usually only one shot can be obtained before the animals hide, but sometimes a second run over them is possible. It is better to kill the male first, for the female will not then run away. The coyotes soon become expert dodgers and squatters.

Aerial photography is also finding an increased use in farming operations. The Department of Agriculture has photographed practically the entire country. From these photos, maps of each area can be placed in the hands of officials, who can check on details of each farmer's plan of production. From them, county associations can allot the acreage the farmer may plant in a certain crop to comply with the AAA plan, and a check can be made to see if the farmer is complying with his part of the program. Incidentally, the maps held determine what crops may best be planted on the land.

A county agent in Oklahoma has used planes to locate broken terraces or new eroded places after rains. This done, repairs are made in record time.

Many ranchers are living in town and commuting daily to their holdings, some of which may be at least a hundred miles away. Some have found that it is easy to eat breakfast at home, fly out and buy several cars of stock, and be back in time for supper.

They Plow Trees Under

Condensed from Missouri Ruralist

Cordell Tindall

THE day of the pioneer clearing timber from his new farm with his ax passed long ago. But today we are seeing clearing operations in full swing—with man once again proving master of Nature.

Daniel Boone and his contemporaries would stare wide-eyed if they could see the modern "pioneer" at work. For, instead of the ax, mechanized power clears the land of trees. The "cat" tractor and the 'dozer, huge plows, power saws, these are the tools of today.

Land being cleared falls into several general types: River bottom land overgrown with willows and other trees; pasture land that has become infested with hedge trees and brush; rough land that is being cleared of scrub oak for future pastures; and general farm land on the "marginal" line that has been allowed the revert back to underbrush.

Of all this land the river bottom area offers the greatest challenge to its owners. The raging Missouri river swept out of its banks over fertile fields 4 years in a row. This year the river behaved itself, and good crops can be found from Hamburg, Iowa, to St. Charles.

During the 4 years in which the river was out of its banks regularly, much lowland grew up in willow and cottonwood trees. These grow as thick as hair on a dog's back—so thick it is almost impossible to walk thru the dense growth. These trees have made a speedy growth in 4 years. Trunks are several inches in diameter, height runs up to as much as 24 feet.

The owner of such land faces the problem of what to do with it. Should he spend the money to clear off the trees, risking the chance of another flood before a crop can be made? To do nothing means that in a few years the land will be almost worthless.

Up and down the river you will find owners who are gambling with the river — as what bottom land farmer doesn't?

One of the most popular methods of reclaiming this land is to plow it with a huge moldboard plow pulled with track-type trac-

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tor. Recently we saw one of these outfits in operation near Lisbon.

If we hadn't seen this plow operate we wouldn't have believed it! Crashing through the thicket of willows and cottonwoods, this plow actually was turning under trees as big as your arm. The tractor, with a battering-ram front, simply pushes over the trees and the plow turns them under.

The plow has a 22-inch moldboard, a 32-inch rolling cutter. Several acres can be plowed in a day.

We climbed aboard the tractor for a round. It was just like tearing thru a forest at breakneck speed. Trees and limbs crashed all around.

The plow does an amazing job of turning under this growth. Only an occasional limb sticking out gives evidence of the "underground forest." By using disking operations either small grain or corn can be planted on this land.

Several Plows are Operating

There are a number of similar plows operating in the Missouri river bottoms. Tom Douglas, state commissioner of agriculture, used a similar plow last spring with excellent results. Corn on land plowed in this manner last spring promises to yield at least 60 bushels to the acre. Thus it is easy to see why owners of this land are willing to take a few chances. A few good corn crops and they have their money back.

In Saline County, a new weapon is being used in an attack on the encroaching willows. The Huesgen brothers, of Marshall, have designed a cutter something like a snowplow that shears off the willows at ground level. This V-shaped device fits on the 'dozer frame of their tractor, cuts a 12-foot swath.

The first such device was made with road-grader blades welded to form a giant duckfoot blade. It cut willows fine, shearing off trees up to five inches in diameter. But the blade was too light to stand the shock of hitting stumps. Much heavier blades are being used in the second cutter. In addition to the two sweeps a vertical blade cuts thru vines. There is also an overhead blade for the same purpose.

After the dense growth is cut off it is raked with a huge tumble-rake, to be burned.

Veterans of bottom-land farming are disagreed as to which is better, to plow under the growth of trees or to burn it off. Both methods seem to have disadvantages and advantages.

It is clear, however, that to make it profitable to clear off this land some type of mechanized operation is necessary. Old-

fashioned chopping with an axe would be slow and costly.

The relatively new farm tool—the bulldozer—is being used as a tool in clearing land of trees in upland operations. With powerful tractors good-sized trees can be pushed out of the ground. Roots and all are pushed out.

A 'dozer was used in clearing pastures that had been allowed to grow up in brush in Howard county last spring. Gradually bluegrass pastures had been taken off by elm, thorn, and other types of trees. This is fertile land, capable of producing good crops.

With the 'dozer work supplemented by a crew with axes and hand tools a considerable acreage was cleared. Estimates of the cost of this work ran about $20 an acre. A small tractor plow turned the sod after the trees were pushed into great piles. This land was planted to corn, grew a good crop this year.

Growth of trees on this pasture land was an extreme case. But many pastures in the state, particularly in West Central and Southeast Missouri, are infested with Osage orange trees. When this growth becomes thick the yield of grass is greatly reduced.

In Johnson county a brush saw has been designed by Francis Irle. This saw is mounted on the front of a tractor, operates parallel to the ground. The tractor is driven up to a tree, the saw cuts it off level with the ground, leaving no stump to hang up mower-sickle bars.

About 500 acres have been cleared with the machine operated by Mr. Irle. A neighbor has a similar outfit and has done considerable work. The saw works perfectly, does a neat, clean job. The fallen trees can be pushed into piles and burned. The saw uses blades up to 42 inches in diameter, can cut down good-size trees.

To prevent the stumps of the hedge trees from sprouting, salt is being applied to the freshly cut stump. It is too early to see how effective this treatment will be.

Saws of this nature that will operate in a position parallel to the ground are being manufactured.

The Fruit Garden

Condensed from American Fruit Grower

H. B. Tukey
Michigan State College

The old-fashioned home fruit orchard has practically disappeared, and properly so. It served a need at a time when all over the country men were testing varieties and locations for commercial fruit growing while still depending on wheat, corn, dairy cattle and livestock for the main income. Some of the important fruit areas of the country were first proved by the home orchard. In a time when rapid transportation, storage, and distribution were not yet well developed, the home orchard kept the family in fruit that it would otherwise not have had, besides sometimes adding a small income.

But those days are past. The several acres devoted to the home fruit orchard are, for the most part, commonly neglected, are a menace to nearby orchards, provide a deluge of fruit at one time or another, and are generally not satisfactory.

Yet the farm without fruit misses something. And to this end the writer should like to propose the "fruit garden," not unlike the vegetable garden in general outline, plan and thinking.

Such a garden is intensive, it occupies a limited area, it specializes on quality and diversity and wide range of usefulness, at the same time it minimizes neglect and the harboring of pests. It emphasizes the small fruits and small trees—perhaps dwarf trees. Europeans have long used this type of garden successfully. It has a place, too, in America.

There will be those who will object to any fruit on the farm, saying that the commercial fruit grower can provide enough. But this view is open to question. The best advertisement for a strawberry, a raspberry, or a peach is a good strawberry, a good raspberry, or a good peach. Too many families are unfamiliar with north temperature fruits. They need to have fresh fruits close at hand, get used to them, and ask for more.

Every fruit garden, like every flower garden and every vege-

Reprinted by permission from The American Fruit Grower, Cleveland, Ohio, Oct., 1946

table garden, will vary with the likes and dislikes of the planter. There will be those who seek a dependable supply of fruit, even though mediocre in quality, at small effort, and others who prefer the choice flavors of the Fairfax strawberry, the McLaughlin plum, and the Macoun apple. The writer would leave the principal supply of a standardized article to the fruit grower and would prefer in the fruit garden the supplemental interests of quality, size, season, shape, color, aroma, and flavor that the fruit garden alone can supply.

Unlike the fruit grower, the planter of a fruit garden has little choice of soil and site. If he does, he should select a well-drained slope, perhaps protected by buildings or a windbreak. It is common knowledge that trees near the protection of buildings often escape a spring frost. If the soil is heavy and inclined to be wet, plums and pears may succeed, whereas cherries will fail. Peaches prefer a light soil.

The home planter should be careful not to overplant. An area 100 x 100 feet sounds small, but it will do. The strawberry will receive first consideration—not too many, but an assortment perhaps starting with Premier, followed by Fairfax and endng with Catskill and the ever-bearing Mastodon and Gem. For freezing, Marshall is good. Twenty-five feet of four varieties each will produce a lot of berries.

The red raspberry will come next in interest, beginning with June, and following with Cuthbert, Marcy, Taylor, and the fall-bearing Indian Summer. A dozen plants of each is enough. For those who like the black raspberry, Plum Farmer is good. For those who like the purple raspberry, Sodus is best. The blackberries and dewberries had best be left out unless one has the time, space and patience to wrestle with them — excellent though the fruit may be. For the currant, try Red Lake. For the gooseberry, try Poorman.

Grapes require a trellis, and for this reason are ruled out by some. Yet they may be grown against a building or over an arbor, and a trellis is not half as difficult as it sounds. A single vine each of the proper assortment will give much satisfaction.

Tree fruits pose a problem. A Montmorency sour cherry tree should probably be standard, though the fruit of Olivet and Reine Hortense is milder and richer and larger regardless of a tendency for the trees to be shy in bearing. Two varieties of sweet cherry, if the climate will permit, will be needed to provide pollination.

Peaches offer a great range.

For cold northern sections, the early white Greensboro is still outstanding along with the late-ripening, yellow Crosby and Chili. For more favored sections, Marigold is a good early yellow. Where a freezing peach is desired, it may be well to wait a few days for Oriole which does not discolor easily upon exposure to the air.

Plums begin with the Japanese varieties, as Santa Rosa and Beauty. Shiro is clear yellow. Formosa is very large. The firm, meaty European types follow with such kinds as the yellow Oullins, and the rich blue Sannois. Did you know that there is a sweet Damson, a "pitless" plum, and a variety shaped like a date?

Pears are a questionable fruit. They may blight badly, and they may fall prey to various insects and diseases. Early in the season there is the bright-cheeked Elizabeth. Tyson is a reliable blight-resistant fall pear, the tree of which will live on and on with little attention. Clapp and Bartlett are standard large, yellow pears. Seckel has a small symmetrical tree with delicious small fruit.

Apples are a problem. The trees get large and out of hand. If there is any question, leave them out, along with the pears. On the other hand, if dwarf trees are available, they are splendid for the fruit garden. If a tree is desired no taller than a man, insist on the Malling IX rootstock. If a tree the size of a peach tree is desired, insist on the Malling I. As for varieties, Yellow Transparent is the standard small tree with early yellow fruit.

The fruit garden provides an excellent opportunity to satisfy that curious instinct that all of us have for trying something new. There is more fun and interest in this sort of thing than there is in trying to raise a lot of mediocre fruit. Consult amateurs, fruit lovers, local fruit men, the county agent, the agricultural college, and experiment station. Take some of the fruit magazines. Get in touch with up-to-date nurserymen. This is the greatest enjoyment of the fruit garden. The best book is U. P. Hedrick's "Fruits for the Home Garden." The New York State Fruit Testing Association at Geneva, New York, has at the moment the widest assortment of material for the home fruit garden, but forward-looking nurserymen are supplying a reasonable choice.

A discussion regarding culture in the fruit garden really requires a special article but a few points may be briefly made. A mulch of straw or some such material is ideal. It conserves moisture, provides winter protection, re-

duces the labor of cultivation, provides a clean mat, and is generally attractive. A nitrogen fertilizer applied in early spring at the rate of about ¼ pound for each year of tree growth will be found not far out of line. Apples will require more.

Control of insects and diseases is often a serious problem. A hand duster or a knapsack sprayer will help, but a power outfit is essential if large trees are included in the garden. Maybe fogs and dusts will some day be perfected to replace the liquid spray, but for the present the spray is best. Custom spraying by neighbors and specialists is increasing and is very satisfactory. For a home-made outfit, a small pump, a motor, and a tank can be rigged up to do the job. It does not take 600 pounds pressure in the fruit garden; 125 pounds will do a lot of spraying.

A general purpose spray that the writer has suggested with considerable misgivings, is called the "Holiday Spray" for the reason that is applied (1) before bloom, (2) After bloom, (3) Memorial Day, and (4) Fourth of July. It is composed of wettable sulphur and rotenone mixed according to the manufacturer's directions on the package. It is not the last word, but it is recommended to give "one less worm per apple" and is far more effective than some of its critics may suspect. DDT will undoubtedly be used more widely as it is better understood and will be a great help. In short, the insect and disease control problem is taking a turn for the better so far as the amateur is concerned.

The home fruit garden, then, can be a garden of delight and satisfaction but like all gardens, including the vegetable garden and the flower garden, it will return in proportion to the time, thought and energy put into it.

Simplified Pedigree Breeding

Condensed from Turkey World

J. H. Florea
Associate Editor

One of the most burdensome and time-taking things about trapnesting, pedigreeing, and progeny testing of either turkeys or chickens is the voluminous numbering and record-keeping commonly required.

Under most systems in general use, the numbering arrangement is fairly complicated; there is usually waste of bands between hatches and between years; and it is difficult to identify individuals without reference to record sheets.

Moreover, when handling birds for selection of breeders, it is usually necessary to refer to several different sheets to obtain all of the desired information.

As a result of these complications, many turkey growers who would like sincerely to do pedigree breeding become overwhelmed by the record-keeping work and give it up, or else get lost in the maze of records and are unable to follow a consistent program.

At Chaumiere Farms, in southeastern Missouri, where extensive breeding work has been carried on with meat type White Hollands for the past 10 years, some simplifications have been worked out that have favorably impressed National Turkey Improvement Plan agents and others who have had an opportunity to observe them.

Breeding pens are numbered -0, 1, 2, 3, 4, etc., through 9. (The Chaumiere plan was designed for only 10 pens.) Females in each pen are assigned a letter, A through N, since each pen contains 14 females. The pen number and hen letter are stenciled in 1½ in. figures on the top and sides of each hen's saddle. These identifications are for one reason only. Permanent identifications, such as pedigrees, always are made by wing-bands which are never lost or duplicated.

In trapnesting, hens are identified easily through a two-inch opening above the trap door before being released from the nest. This eliminates handling the birds, provides positive identification and permits the attendant's undivided attention in securing the egg from the nest and

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marking it, over the air cell, with the same figure and letter that appear on the hen's saddle. The eggs are carried to the egg cooling room where they are deposited in a wire bottomed egg rack, which has been partitioned into as many compartments as there are hens in the pedigree pens. This speeds up the operation when the eggs are trayed for the incubator, and it is comparatively simple to keep the eggs together until they are finally candled and placed in the hatching trays.

With an expectancy of 400 poults per pen, No. 4 Zip wing bands are ordered for 10 pen units with numbers 1001-5000, specifying that space be left between the right digit and the rivet hole, for stamping the dam's letter. That box of 100 bands, out of each series of 1,000 bands, whose second digit from left corresponds to a given pen's number, is assigned to that pen. For example, pen 4 received 1401 to 1499, 2401 - 2499, 3401 - 3499, 4401-4499. Affiliated associations, farm identifications, year numeral (if any), and other desired markings may be put on the other end of the band. Poults from one hen may have in a single season bands from each of these different boxes. For example, on April 26, bands 1136-B through 1139-B were applied to the progeny of hen 1-B. On May 13, the progeny from this same hen received 2130-B-2134-B, and on June 6, 3111-B-3116-B.

Consecutive years' bands are ordered as needed, beginning with the highest number previously ordered. Thus serial numbers are never repeated or duplicated, and the sire (pen number) as well as the dam's letter appears on each band by hand stamping only one symbol.

A final step in the simplification of record forms is the development of a single sheet on which all pertinent information concerning the eggs set and poults hatched from a given mating is recorded throughout the entire growing season. At the top of this form, the sire and dam are identified. Below this are as many horizontal lines as a hen is likely to set eggs in a season. Vertical columns are arranged from left to right for hatch date, number of eggs, mortality, sex, wing band number, body weight, shank length, width of breast, etc., and two blank columns for special notes, one for disqualifications and defects, and a final space for disposition and remarks. Horizontally, a line is assigned for each egg set. Any egg that fails to hatch is recorded in the mortality column, and the cause specified. This is considered a strong point of the form, in that it prevents building up an urge to use

as a breeder an outstanding individual from a family that has not hatched well.

Still another helpful device at Chaumiere Farms is the adjustable pedigree sections that have replaced wire baskets. Standard hatching trays are divided into three long narrow sections, by two removable partitions. These sections being subdivided by smaller partitions may be adjusted to accommodate any number of eggs without wasting any space. More eggs can be hatched per tray by the use of these, the poults have more head room, and they are much easier to clean than are wire baskets.

Short-cuts such as these are especially desirable in these times of labor shortage, but their use at any time increases the efficiency of labor and helps to take some of the drudgery out of the business of pedigree breeding and progeny testing.

Introducing InLaC

Condensed from Soil Conservation

Dorothy Rowe

THE International Land Club is in process of being organized in America. InLaC (for short) already is under way in Great Britain. One of its aims is to help young people see for themselves how other nations are meeting their postwar land problems.

Young people in Great Britain and the United States will visit each other's countries to widen their knowledge of proper land use. As the plan develops it may later be expanded to include young people in agricultural communities in Europe as well as in America and the British Empire.

InLaC membership will comprise boys and girls of 17 and over who give evidence of a genuine interest in the land and in rural life. An important byproduct of the venture is that it will foster friendship and good relations between English-speaking nations and the peoples of Europe.

By 1947, when the organization will begin to function, it is expected that youth ships may be operating between England and the United States, offering a round trip at a cost as low as $75 plus $1 per day for food.

The heavier expenses of over-

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seas travel will be financed by a central fund, and a current account for local administrative expenses will be financed by subscription. At present all work is being done voluntarily, and all funds are being raised by members. But when the first exchanges have been successfully carried out, grants will be sought.

In England members are raising money for the central fund by arranging dances, entertainments, and whist drives. The young people are preparing for visits abroad by becoming informed on conditions in other lands. At the same time they are storing up knowledge about Great Britain and the Empire. Youth hostels will be a meeting place for club members and overseas visitors.

The exchange plan was drawn up to help young people who neither would attend college nor have the means to travel abroad but who would profit from training in world citizenship. The idea was evolved especially from the Women's Land Army in England.

Eventually farmers in the United States will have an opportunity to indicate whether they can use the services of English workers and if so, how many. This will help the directors in placing the young people to good advantage. Similarly, district supervisors interested in having some of the young people from their districts get farm experience in England will be asked to forward their names to the proper authority.

Already Mr. and Mrs. Monroe Smith, co-directors of American Youth Hostels, Inc., have offered a year's work to a member experienced in dairying. The organization has a farm in connection with its International School at Meredith, N. H., where members were trained for emergency labor during the war and were then placed on New England farms.

At Washington Court House, Ohio — about 30 miles from Columbus—arrangements are being made for an exchange of English land workers and local farm youths. Ohio has a group of of young land workers who are practically organized, according to Harry Culbreth, organization director of the Ohio Farm Bureau Federation. This group corresponds in age to the InLaC membership: 17 to 35. The young people are those who wanted to join the armed forces but could not be spared from the farm. "They are enterprising, with a great capacity for raising funds," said Director Culbreth.

Besides American Youth Hostels, Inc., and the Ohio Farm Bureau Federation, other organizations that have volunteered

assistance are: The English-Speaking Union, Associated Country Women of the World, Youth Hostels Association, National Farmers' Union, National Association of Girls' Clubs, the National Council of Women, and the Y. W. C. A.

How do young people in this country regard InLaC? Two girls who were among the first to put in an application to go overseas wrote as follows:

"We are both tremendously interested in the idea. Though we realize that living conditions abroad are not easy, we are anxious to work hard and do our best to make the project a success. We both have had quite a a bit of farm experience and feel that we may be able to help on whatever needs to be done.

We are particularly interested in living with a farm family, if that is possible, since we want to learn something about the life of the country. We realize that the amount we could earn would not cover our expenses and are able to pay a good part of them."

There's no telling how far InLaC will go once it gets a good start. Certainly there never was greater need for putting soil and water conservation practices on the land than there is today. Progressive farmers know that the advantages of safe, scientific farming are many. But if there were only one—the average 20 percent increase in per-acre yields of various important crops—it would still be the key to preventing starvation in other lands.

Mrs. Neve Scarborough, who is setting in motion the wheels of InLaC in America, is enthusiastic about its possibilities and its chances for success. With such inspiring leadership the young members of International Land Club should accomplish much in helping to find solutions for land problems in their own countries. Her enthusiasm is not based on lack of experience either, for she was an executive of the Famous Women's Land Army in England during World War II and knows what young people—especially girls—can do on the farms.

As Soil Conservation goes to press, Mrs. Scarborough reports:

"Our membership in England is growing rapidly, and 25 percent of the members have made their first pilgrimage to Denmark very successfully this year. Next year those whose jobs won't allow them to come so far afield as America or Canada will be going to Holland. And I have now had my first eager inquiries from India, where it is felt, it should be established to operate provincially first, and then internationally." So we progress, despite the setbacks.

Handling Poultry Manure

Condensed from Poultry Tribune

H. R. Cox

Extension Specialist in Soils, New Jersey Agricultural Experiment Station

ALTHOUGH poultry manure is widely recognized as a valuable fertilizer, the difficulties of handling this material have prevented many poultrymen from realizing a profitable return from its sale or use.

If the operator grows extensive acreages of field crops, the best use he can make of the manure is to apply it to his own land. Many poultry farms are small, however, producing few. if any, field crops. Those operators who must look for a market for this manure should consider means of handling the material so that it will be attractive to prospective purchasers.

The analysis or plant food value of poultry manure is quite variable, depending upon moisture content, how it has been stored, and the amount and kind of litter present. Fresh manure from dropping boards usually varies from 60 to 75 percent moisture. Pit manure may contain nearly 80 percent moisture. Floor manure is much drier than either, but is so diluted with litter that the analysis may be no higher. Poultry manure may lose much of its organic matter and nitrogen when left in piles that cannot dry out rapidly; this is especially true where the piles are exposed to rains and snows.

Analyses of many samples of fresh poultry manure from dropping boards indicate that, on the average, this material contains about 1 percent nitrogen, 0.8 percent phosphoric acid, and 0.5 percent potash, or about twice as much nitrogen and phosphoric acid as fresh stable manure. Analysis of the same kind of poultry manure, properly stored and air dried, is about double the above figure, roughly 2-2-1; such material has a plant food value of about $8 a ton. On the other hand, many piles of poultry manure have been so poorly stored and are so offensive to handle that poultrymen find it difficult to give the material away for the hauling.

Since it is usually necessary to permit poultry manure to accumulate in piles before disposal, and since most manure from the dropping boards or pits can lose

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its value rapidly in storage, it is frequently desirable for poultrymen to undertake one of several measures to preserve its value. These measures include treatment with chemicals, handling to encourage rapid air drying, and dehydration or artificial drying.

Two chemicals have been used to preserve poultry manure and increase its value. These are superphosphate and hydrated lime. Treating moist poultry manure with superphosphate has been found highly effective in arresting the loss of nitrogen and increasing the phosphate content of the manure. Superphosphate of the 20 percent granular grade is distributed on the dropping boards at the rate of three to five pounds a week for 100 birds.

Hydrated lime, added to moist poultry manure at the rate of about 200 pounds to the ton, raises the alkaline value of the manure high enough to check its breakdown and resulting loss of nitrogen. Further, this is a convenient means of getting the lime on the land. Use of hydrated lime is especially desirable in the case of very moist pit manure, as a method of arresting odors, preventing the breeding of maggots in the manure, and making the material drier and easier to handle.

If the manure is to be used on the farm where it is produced, the superphosphate treatment often would be preferred. Where the manure is to be sold, the hydrated lime treatment might be better. Some poultrymen have found that it is a good practice to scatter a little hydrated lime on the poultry house floor to dry the litter manure and to eliminate odors.

If a poultryman has a cement floored out-building that is suitable for storing manure, he can adopt certain measures of handling the material to make an easily marketable product. I know a large poultry raiser who has a concrete building, with screened windows, which is given over entirely to the storage of manure. The floor manure, dry and mixed with litter, is collected twice a year and placed in a corner of the shed. Fresh dropping-board manure, gathered two or three times a week, is scattered evenly on top of a small, flat pile of the floor manure. This pile is then built up, layer by layer, the dropping board manure drying out fairly rapidly in alternate layers with the floor manure. When the pile is complete, it is sold at the farm to nearby vegetable growers at about $6 a ton.

A number of dehydrators have been installed on poultry farms to dry the manure artifically. It has been found that it costs at least $15 a ton to produce the

completed product. It is believed that at present this method must be considerably improved before there will be much increase in its use.

How may poultry manure best be used as a fertilizer? As has been noted previously, this material is quite variable in analysis of plant nutrients. It is safe to assume, however, that, on the average, farm poultry manure does not analyze much above 1 percent nitrogen, 1 percent phosphoric acid, and one-half percent potash. It is apparent, then, that poultry manure is primarily a nitrogen fertilizer and is most useful to crops which respond well to nitrogen. This includes leafy vegetables, such as lettuce, spinach, and cabbage. Grass sods for hay, pasture, and lawns are excellent places to spread poultry manure. Fruit trees respond well to the material.

Many other kinds of crops, however, need higher percentages of phosphate and potash materials. Indeed, some crops may be overstimulated with nitrogen by making excess applications of straight poultry manure.

An application of 8,000 pounds of poultry manure, with 600 pounds of 20 percent superphosphate, is equal to about 2,000 pounds of a 4-10-2 fertilizer. This is about the analysis that would be obtained by applying three pounds of superphosphate a week to the dropping boards for 100 mature birds. If this combination of poultry manure and superphosphate is supplemented with 260 pounds of 60 percent muriate of potash, a mixture is obtained which is equal to one ton of 4-10-10 fertilizer. This is a good general - purpose mixture for many kinds of crops, including corn and tomatoes.

Another way of supplementing poultry manure to make a better balanced fertilizer is to apply 8,000 pounds of this material and 600 pounds of 0-14-7 fertilizer. This combination is equal to about a ton of 4-8-4 fertilizer, also suitable for a variety of crops.

Still another excellent way of supplementing poultry manure, especially for crops that need a fairly high proportion of nitrogen in quickly available form, is to apply 8,000 pounds of poultry manure and 500 pounds of 4-8-12 fertilizer, thus giving the equivalent of a ton of 5-6-5.

For most crops, a favorable rate of applying poultry manure is between 3 to 8 tons per acre, supplemented where necessary with phosphate and potash fertilizers. As a top dressing to hay and pasture sods, poultry manure is usually applied between fall and spring. For clean cultivated crops it may be applied either

before or after plowing. If applied after plowing, it is well to work it into the soil with a disk harrow a week or two before planting. Poultry manure that is applied at heavy rates as a side-dressing to growing crops can be damaging. There is little danger of burning the plants, however, if only moderate side-dressing applications are made.

The New Sweetclovers

Condensed from Nebraska Farmer

John M. Slatensek
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LEGUMES occupy an important position in the rotation scheme because of their ability to add nitrogen to the soil.

Sweetclover is regarded as being one of the outstanding legumes for this purpose. As much as 150 pounds of nitrogen per acre can be added to the soil by plowing under a stand of sweetclover in the spring of the second year of growth. This is equivalent to about $15 worth of commercial nitrogen fertilizer. Nodules on the roots contain bacteria which are capable of removing nitrogen from the air and making it available to the plants. On being plowed under the sweetclover then becomes a source of nitrogen for succeeding crops.

In the past, the two varieties grown almost exclusively were Common Yellow and Common White.

Recently three new varieties have appeared on the scene which seem destined to replace a large part of the sweetclovers now being grown. Furthermore, they will provide extra profits to seed producers in the form of premium prices. These new varieties are named Madrid, Spanish, and Evergreen. Because of their superiority in many respects over the commonly-grown sweetclovers they have been admitted to the list of certified crops for Nebraska. Certified seed of these new varieties was produced on approximately 125 acres during 1946. The high esteem in which farmers hold these new sweetclovers is indicated by the large numbers of local and outside requests for seed.

Madrid, Spanish, and Evergreen are best known for their increased forage and seed production and their greater seedling vigor. In addition, the Evergreen variety will furnish longer

Reprinted by permission from the Nebraska Farmer, October 19, 1946

pasturage in the second year of growth since it is about three weeks later in maturity than Common White. Because of their abundant first-year growth it is usually possible to obtain good pasturage in the fall of the first year. Hay made in late fall and properly cured will approach alfalfa in quality. Possessing greater seedling vigor the new varieties are better able to get the jump on weeds and choke them out. This results in a first-year hay of low weed content and increases the chance of getting a good stand particularly in years of drouth.

The common practice in Nebraska for establishing stands of sweetclover is to seed as early in spring as weather conditions permit the preparation of a good seedbed. The crop is grown either alone or more commonly with a companion crop of oats or barley. Where a companion crop is used the seeding rate of the grain is reduced to three-fourths that of normal. At the lower rate of seeding the yield of grain is only slightly reduced yet a more favorable condition for the growth of the sweetclover seedling is thereby provided .

The rate of seeding the sweetclover varies from 8 to 16 pounds, depending upon seed quality and seedbed condition. In general, the lighter rates can be used where grown for seed, the heavier rates where grown primarily for pasture or soil improvement. Seeding ½ inch deep in a firm, moist, well-prepared seedbed such as one would make for alfalfa is most favorable for germination and seedling growth. Light soils may require a depth of one inch or slightly more but in no case should the seed be sown deeper than necessary to obtain moisture for germination since deep sowing may result in failure, particularly on heavy soils.

Inoculation of the seed with suitable commercial cultures is inexpensive and is recommended if the field has not previously grown a well nodulated crop of sweetclover or alfalfa. The crop may be expected to respond favorably to liming where soil tests have indicated an acid condition.

Profitable seed yields of Madrid are easy to obtain. The seed crop of this variety is handled in the same manner as are the commonly-grown sweetclovers. Ordinarily yields of from 3 to 10 bushels of seed can be expected per acre, depending upon rainfall, insect pollination, shattering by wind, etc.

Increased yields of crops following the sweetclover seed crop are the general rule. A. T. Hutchinson of Waverly who has grown certified Madrid for the

past three years, had this to say, "Our wheat has gone 15 to 20 bushels better where it has followed the Madrid seed crop." Many farmers have observed similar benefits to their crops following sweetclover.

Successful seed production of Spanish and Evergreen requires that the grower keep in mind that these varieties differ in growth habits from the common varieties. Customary seed production methods will therefore generally not be adequate. Spanish and Evergreen grow more coarse and rank than the ordinary varieties and therefore steps to reduce second-growth are advised, especially in years of favorable growing conditions Reducing the height of the plants not only will greatly facilitate harvesting but will also minimize the amount of seed lost through shattering. Setting back the growth of the large coarse-growing varieties can readily be accomplished either by early spring grazing or clipping in the second year. Pasturing in April and early May or clipping 10″ high when the plants have attained a height of 16 to 24″ will generally furnish a second growth sufficiently reduced in height and coarseness to be readily harvested. The amount of setting back will of course depend upon growing conditions. In years of poor growth no clipping may be necessary; under very favorable conditions the plants can be cut when a height of 24 inches is reached. It should be remembered, however, that in clipping second-year sweetclover a stubble of at least 10 inches should always be left, otherwise poor recovery from the clipping treatment might result. If the spring growth is pastured, the effects of uneven grazing can be corrected by mowing the plants to a uniform height.

Sweetclover is predominantly a cross-fertilized crop and pollination is effected almost entirely by insects such as bees. A large population of pollinating insects working the flowers improves the prospects for large seed yields. Although insects are usually sufficiently numerous for satisfactory yields, the grower may, nevertheless, increase seed set by soliciting the aid of beekeepers in his locality who are usually willing to locate some of their hives in or near the field of sweetclover. One acre of sweetclover bloom will support one hive of bees.

Since bees are able to carry pollen from surrounding undesirable plants, isolation of the certified seed fields from other sweetclovers is necessary in order to keep the varieties pure. It is not necessary, however, to isolate yellow - flowered sweetclovers from white blossom since these

two types will not cross. Farmers contemplating the production of certified seed can obtain application blanks and regulations regarding isolation and other matters pertaining to certification by writing their local county agent or writing directly to the Nebraska Crop Improvement Association, College of Agriculture, Lincoln.

In three to four weeks after pollination depending upon climatic conditions the seed reaches maturity. In practice the crop is cut for seed when about one-half of the pods have turned dark brown to black.

Among the various methods available for harvesting the seed the use of a windrower and pick-up combine has been gaining in popularity. This method is being used by many of the successful certified producers in the state. A regular grain binder with the trip arm and bundle carrier removed can be used for cutting and windrowing. Better yet is a commercial windrower. With it sweetclover can be windrowed with a minimum of seed due to shattering since such machines cut and rather gently lay the plants in a row. An entirely satisfactory windrower can be constructed out of an outworn grain binder.

Windrowing in the early morning while the plants are still damp with dew will help reduce shattering of seed. After the plants have dried for several days in the windrow (4 or 5 days of good drying weather is usually sufficient) a combine with pick-up attachment is employed for gathering the plants and threshing out the seed.

DDT Dust Controls Chinch Bugs

Condensed from New Jersey Agriculture

THE hairy chinch bug, *Blissus hirtus,* is a serious pest on many lawns, golf courses and playing fields, particularly during dry, hot years. It is a sucking insect which feeds near the base of the leaf where it escapes unnoticed by most home owners.

Nicotine or rotenone dusts have been used to control this pest but they have not been very satisfactory. Last year we discovered that either DDT or Sabadilla will give much more effective control. Our experiments have demonstrated that a dust containing a 10 percent concentration of either of these materials, applied at the rate of 100 to 200 pounds per acre, will kill practically all the chinch bugs present. The heavier rate which is equivalent to about 5 pounds per 1,000 square feet of lawn, is recommended where the dust is to be applied with hand equipment. When the dust is applied with a machine equipped with a trailer cloth the smaller rate will give satisfactory results.

In June, 1945 we applied a 10 percent DDT dust to 40 acres of the Rutgers athletic fields which had a heavy population of chinch bugs. Extensive scouting of the fields at intervals throughout the summer failed to reveal any live bugs. In July a severe infestation on the bent grass lawns of the State House at Trenton was called to our attention. Since the lawn area was adjacent to buildings and cut up into small plots, dusting did not seem feasible. For that reason we decided to apply the DDT wettable powder at the rate of 2 pounds per hundred gallons of spray. We found that thorough coverage of an acre of lawn could be obtained with 600 to 800 gallons of spray which was equivalent to 6 to 8 pounds of actual DDT per acre. Before we sprayed our counts showed an average of 117 chinch bugs per square foot. A week afterwards this had been reduced to an average of 6 which represents a reduction in population of 96 percent. Since over 5 inches of rain fell during the 7-day period following the spray application, we considered this kill excellent. Subsequent inspections of this lawn showed that the chinch bugs were kept under control for the entire season by this one spray application.

In August we applied 10 per-

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cent DDT dust to infested greens at the Knoll Country Club at Boonton and again we obtained complete control. Greens treated with rotenone still had a rather heavy chinch bug population 10 days later.

It is interesting to note the difference in the speed of toxic action between DDT and Sabadilla. Sabadilla acts rapidly. Within a few hours after the dust is applied the chinch bugs are paralyzed with death occurring within 48 hours. DDT acts much more slowly with the chinch bugs remaining in a sluggish torpid state for 4 to 5 days before dying. However, the DDT has the advantage of continuing to kill for 10 to 14 days or more following application, the length of time depending largely on the amount of rain that falls. This is long enough to kill all chinch bug nymphs which hatch from eggs that were present when the dust was applied. Sabadilla does not seem to have this residual action.

Extra Feed Makes the Eggs

Condensed from Everybody's Poultry Magazine

Paul Worcester

Would you swap 11 pounds of feed for 80 eggs? That would be a good business deal any time, yet lots of poultrymen miss the boat by not getting extra feed into their pullets—feed that will produce money-making eggs.

Records kept on White Leghorns show that a pen of bred-to-lay pullets which consumed 69 pounds of feed laid 110 eggs while birds fed 80 pounds of feed produced 190 eggs. Same birds, same feed, same housing, but an extra 11 pounds of feed made a difference of 80 eggs.

When a pullet goes into a laying pen, she is not yet fully mature. She is going to use much of her feed for a while to grow and develop. How many eggs you are going to get out of her will depend upon how much feed you can get into her over what she requires for growth. Cheap feed or a good feed not properly fed will likely give you some eggs, but if a pullet is going to pay her board bill from hatching time un-

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til maturity and, on top of that, give you a profit, you can't be content with poor production.

Although some feed ingredients are still scarce, grain is plentiful and reliable feed manufacturers are making high quality products available to poultrymen. When feeds are mixed it is with the idea that a definite ratio of mash and scratch will be maintained. Money spent for good feed is wasted if it is not properly fed.

Those are the first two steps in getting high fall and winter egg production: (1) Use a good feed; (2) Follow the directions for feeding.

Next comes the problem of getting the birds to eat enough feed to lay at a rapid rate while continuing growth. The simplest way to increase feed consumption is to allow more hopper space. Allow 20 to 30 feet of hopper space for each 100 birds when they can get at the hoppers from both sides, twice that with hoppers accessible from only one side. Many poultrymen find that small hoppers put at the end of roosts or other out-of-the-way spots will allow the timid birds to eat without interference from the "bosses."

Pellets and wet mashes fed at noon will encourage birds to eat more and are necessary in cold weather and when you want to force the flock.

Artificial lighting is no longer a novelty in the poultry business, though the question of which is the best system of lighting is always good for an argument at a poultry meeting. Dependable time switches, with dimming attachments which will allow both early morning and evening lights, are now on the market. Keep the birds on a 13 hour day to maintain steady production without forcing.

Don't be content to let your birds set their own standards for feed consumption. Real profits will be made only if the birds are encouraged to eat the maximum amount of feed, on which they will produce to the peak of their ability to lay.

What It Takes to Feed a Cow

Condensed from Eastern States Cooperator

Prof. J. C. Archibald
Massachusetts State College

THE acute feed shortages of the past two years in the Northeast have for the time being disappeared, at least in so far as the cereal grains and mill feeds are concerned. There is still, however, a shortage of protein concentrates and there is no guarantee that shortages of carbohydrates will not recur at unpredictable intervals in the future. At such time farmers will of necessity make certain adjustments in their feeding practices in order to meet situations as they develop. Some of our experiment station observations may be of help to eastern dairymen in making such adjustments.

We can all recollect the time when much stress was laid on quality in protein. It was a rather natural sequence to the discovery of the amino acids, those fundamental structures which when put together in varying combinations result in the great variety of proteins which occur in nature. As a result of much research it was found that some proteins lacked certain of these amino acids and that others contained insufficient quantities of certain essential ones. It was then found that mixtures of proteins from different sources were more adequate for growth and reproduction and lactation than individual proteins were.

These findings received the usual publicity that such things do, and feed manufacturers and distributors generally scrambled to get onto the band wagon. Grain mixtures were formulated with six or eight sources of protein instead of two or three as had been the practice for years and "biologically complete" protein became a salesman's argument.

It is not the intention here to belittle the importance or validity of the fundamental research which has been done on the proteins; for humans, for small animals, for poultry, for pigs, and for young calves it has vital significance in feeding practice. The mistake that was made was in assuming, because all these other species need variety in protein, that it is therefore an important consideration for dairy cows. We

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know better now, and although "hindsight is always easier than foresight," it seems in retrospect that we should have realized long ago that the cow with her compound stomach would not have the need for such refinements in her ration.

Research in recent years on the function of the rumen, or first stomach of the cow, has shown that with the aid of bacteria and other microorganisms which are normally present in this capacious bread basket, the cow is able to build protein suited to her needs from much simpler substances. Some investigators are of the opinion that she also can and does rework, to some extent at least, the preformed proteins of the feed in similar fashion. Since this is so, cows should produce just as well on simple grain mixtures as they do on a complex formula that furnishes protein from perhaps half a dozen sources. Recently workers at the Ohio Experiment Station have demonstrated in practice the soundness of these research findings. With large groups of cows they have shown that on good pasture or when fed good quality legume-mixed hay and corn silage in the barn, milk production was about the same while cows were fed a simple mixture consisting of ground corn, soybean meal and minerals as when they were fed a complex grain mixture containing, in addition to the corn and soybean meal, oats, bran, linseed meal, molasses and beet pulp.

In brief, then, it may be safely stated that quality in protein is not a significant factor in the feeding of cattle. The one exception is that the young calf's compound stomach is not yet developed to the point where it functions efficiently.

Amount of protein fed also warrants some discussion here. A few years ago it was rather definitely shown that with good quality roughage the protein content of the grain mixture need not be above 16 percent. More recently work has been done which seems to indicate that regardless of the kind of roughage fed, 16 percent of protein in the grain is ample, and that the limiting factor in milk production is not intake of protein but intake of TDN.

This may seem, at first glance, like a strong statement, so to make more clear just how we have arrived at such a conclusion, let us consider the data on Table 1. These figures show the composition of two different lots of hay taken from the same farm on the same day. It is true that they represent extremes in composition perhaps not often found, but they have been chosen because, showing such extremes, they il-

lustrate rather clearly this and other points of this discussion.

The next group of figures (Table 2) sets forth the requirements of an average cow according to accepted feeding standards. It is assumed for the purposes of our discussion that the cow weighs 1000 pounds and that she is producing daily 30 pounds of 4.0 percent milk.

A cow of this weight will consume on the average about 20 pounds of hay or its equivalent daily if the hay is of good quality. Based on the analyses of the hays

TABLE 1

Composition of Hay Samples*

Sample No.	Moisture	Protein	Fat	Fiber	N-free Extract	Ash	Calcium	Phosphorus	Carotene
1	12.1	12.3	1.9	25.1	43.6	4.9	0.81	0.20	26,400
2	11.1	4.4	1.4	34.6	46.2	2.3	0.33	0.09	3,030

*All values except those for carotene are percentages; carotene is reported as International Units of vitamin A equivalent per pound of hay.

TABLE 2

Dietary Requirements of An Average Cow

Cow "X" (wt. 1000 lbs.)	Digestible protein	Lbs. daily TDN	Carotene (units)
Requires for maintenance	0.60	7.00	150,000
— for milk production	1.23	9.21	
Total requirement	1.83	16.21	150,000

TABLE 3

Fitting the Ration to Requirements

	Digestible protein	TDN	Carotene
Sample 1			
(a) 20 lbs. of hay furnishes	1.60	10.31	528,000
Pounds of 16% grain needed to make up the difference	1.75	8	none
Sample 2			
(b) 20 lbs. of hay furnishes	.57	9.52	60,600
Pounds of 16% grain needed	9	9	*
Sample 2			
(c) 16 lbs. of hay furnishes	.46	7.62	48,480
Pounds of 16% grain needed	10	12	*

*In so far as carotene is concerned, Sample 2 of hay presents an impossible situation. The amount of grain necessary to make up the deficit is far above the limit set by economy or the welfare of the cow. The only practicable solution is to feed some good quality hay (of adequate carotene content) along with the poor stuff.

given in Table 1, on average digestion coefficients, and on the cow's requirements, what are the limiting factors that determine the amount of grain to feed? An attempt to answer this question is set forth in Table 3 (a).

In so far as Sample 1 of hay is concerned, we see at a glance that the limiting factor is TDN. This hay supplies enough protein so that less than two pounds of 16 percent grain are needed to make up the total protein requirement, while it takes eight pounds to supply sufficient TDN. Let us look now at the figures for Hay Sample 2 (Table 3, b). Here the argument apparently is a bit weak because it takes the same amount of grain to furnish the necessary protein as it does for TDN. Note, however, the use of the adverb "apparently." As you will all agree, the catch is that a cow will not eat as much of the Sample 2 hay as she will of Sample 1. Sample 1 is a clover mixed rowen; Sample 2 is late cut, overripe timothy. How much less will she eat of Sample 2? Well, one guess is about as good as another, so let's assume for easy figuring, 20 percent less; *i.e.*, 16 pounds (Table 3, c). It should be clear from these figures that the limiting factor in determining the amount of grain to supplement roughage, good or poor, is not protein as we have so often thought, but TDN, and the better the roughage the more apparent this becomes.

Mention of TDN brings us to the next logical point in our discussion: the carbohydrates—that portion of the feed which furnishes heat and energy to maintain the body processes and to enable the animal to do useful work such as milk secretion. The carbohydrates constitute the ma-

TABLE 4

Variation in Certain Constituents of Hay from Year to Year

	Percent total sugar in the dry substance	Carotene units of vitamin A equivalent per lb. of hay
Mixed hay — 1st cutting		
— 1944 crop	3.73	5,650
— 1945 crop	2.85	2,845
Mixed hay — 2nd cutting		
— 1944 crop	4.40	30,037
— 1945 crop	1.68	15,383
Red clover hay		
— 1943 crop	5.22	18,300
— 1945 crop	2.39	8,868

jor portion of the TDN. Some work done at the Massachusetts Experiment Station last winter is of interest in this connection.

New England farmers do not need to be reminded that although we had a heavy hay crop last year (1945), much of it was of poor quality because of very unfavorable weather during the haying season. Some observant farmers were interested enough to ask us what we thought the hay lacked. Not wishing to venture out on a limb, we asked their cooperation in furnishing samples of the hay for grading and analysis. A total of 25 samples was secured, 15 of which were from the 1945 crop, four from the 1944 crop, and six from the 1943 crop. In addition to the usual fodder analysis (protein, fat, fiber, etc.), total sugar and carotene were determined in all samples. Some of the more striking results are shown in Table 4.

A glance at these figures shows that the 1945 samples of the kinds of hay indicated were without exception lower in sugar and carotene than similar samples for the 1944 crop. In most cases the values were about half or less than half. Incidentally also, although not shown here, the 1945 samples were in general lower in crude fat and minerals and higher in fiber. But let's pass over for the time being all these other things and center our attention on the values for total sugar. What have they to do with carbohydrates? Just about everything. Sugars are carbohydrates in themselves, and furthermore they are stepping stones in the growing plant to other and more complex carbohydrates such as starch, cellulose and pentosans. All of these, simple sugars included, are important sources of food energy. Here, then, seems to be one reason why the 1945 hay crop did not measure up to farmers' ideas as to what constitutes good hay.

The question may be raised as to why the sugar was relatively low in these samples of hay. The answer probably is to be found in the kind of weather we had. That part of the season when hay is growing and being harvested was about as wet in this region last year (1945) as anything on record. Less sugar than usual may have been formed in the plants because of the lessened amount of sunshine; but, in our opinion, of more importance in causing these low values was the excessive "sweating" of hay stored too damp. "Sweating" always is more extensive in damp hay than in that which has been well dried, and it proceeds at the expense of soluble organic compounds of which the sugars are typical.

Someone may remark that a difference of two or three percent in sugar content of a roughage ought not to make much difference to a cow; she doesn't eat much sugar anyway. That might be true if the cow got all the nutrients she needs directly from her feed as eaten, but recollect for a moment what was said in the discussion on protein regarding the function of the cow's first stomach. The micro-organisms present in the paunch, which are so important in proper handling of the rough feed a cow eats, operate best when they have available for their own use a good supply of readily fermentable carbohydrate. Many of the sugars found in plants are in this class. It is not, then, much of a stretch of the imagination to suppose that roughage relatively low in sugar may not be as thoroughly broken down by the digestive process as is necessary in order for the cow to get maximum benefit from it.

The practical significance of all this in a period when grain is scarce and high priced is simply this: good quality hay or other roughage will require considerably less grain for the same amount of milk than if the roughage is poor stuff. Intelligent farmers do not need to be reminded of that fact, but this work on sugar in hays is perhaps one more reason to emphasize it.

Now let's go back to Table 4 for a moment and look at those carotene values—maybe we can find another reason. We have known for years that high quality roughage is the most practicable source of carotene. We also know that a cow's requirements of this vital pigment for good health and normal reproduction is approximately 150,000 units daily. Some simple arithmetic shows us that it would take about 53 pounds daily of the 1945 sample of first cutting mixed hay to satisfy that requirement, while five pounds of the 1944 sample of rowen would do the job. Not even the largest Holstein cow has a bread basket capacious enough to hold 53 pounds of hay daily.

Is it mere coincidence that this past winter we had more complaints about calf losses and breeding troubles than we have had in a long time? We think not. These figures show at least one good reason for these difficulties, and they score a ringer for high quality roughage.

To sum up briefly, it is our belief that the only way for most eastern farmers to offset recurring grain shortages is through the growing of better roughage and more of it.

Growing Legumes on Acid Soils

Condensed from The Rural New Yorker

William A. Albrecht

A SIGNIFICANT degree of soil acidity has long been considered a troublesome condition for legumes, particularly those more desirable as forage for livestock. Yet it is highly probable that native legumes once grew well on those same troublesome soils when they were first cleared of virgin timber or plowed out of the prairie sod. Failures of many legume crops to return the cost of their seedings have generated the desire to find some acid-tolerant legume of high feeding value. The hope of finding such a legume has long been a tantalizing problem for many agronomists.

Now that we are moving forward to a better understanding of how the clay, or the dynamic fraction of the soil, becomes acid and sour, and how it is a kind of a jobber that may carry in stock the supply of plant nutrients from which it takes acidity, we have come to realize that legumes may actually tolerate acidity. We now know that this is true, provided they have access to a well-balanced supply of nourishment from the soil, or have ample fertility in the presence of acidity.

An acid condition is perfectly natural in regions where intensive and productive agriculture is located. Such an industry establishes itself by the help of, and on soils formed by, annual rainfalls high enough to have water going down through the soil. It demands moderate temperatures. Such climatic conditions leach the soil with carbonic acid and carry plant nutrients away in solution as we know from the hard waters that make up the ground water. These are the conditions that prevail in the Eastern half of the United States. They also prevail in the temperate zone where annual rainfalls are more than approximately 30 inches. In other words, they prevail where the precipitation exceeds the evaporation. Such combinations of climatic forces of soil development produce a clay, the particular chemical composition and structure of which give it a high capacity to absorb and exchange, that is, to take up and to give up, many elements of both nutrient and non-nutrient values to crops. It is, in reality, a fortunate natural circumstance, namely, that where the rainfalls are high

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enough to grow crops abundantly there should also be this large capacity of the clay to hold acidity to a correspondingly high degree. This is good fortune because such high capacity for holding soil acidity is also the same high capacity for holding fertility or crop nourishment.

Since the highest agricultural productivity now exists in those soils recognized as acid, and also in those which were acid to possibly a lesser degree in their virgin state, can the soil acidity itself be the cause of the difficulties in growing legumes? If these virgin soils built themselves originally to high levels of organic matter by taking nitrogen from the only ultimate source, which is the air, surely there must have been some legumes and some nitrogen-fixing bacteria growing in them.

Acidity and Fertility on Clay

In breaking rock down to make soil, it is the carbonic acid in the rain water that is the main responsible chemical reagent. Clay is a residue of that process. Different kinds of clay result according to different combinations of temperature and rainfall. At the same time that these different clays are being produced, they are also being stocked with varying amounts of the different chemical elements, both plant nutrients and non-nutrients. This happens while these separate elements are being broken out of the rock and while moving down through the soil in dilute solution. They are being concentrated on the clay through its action both as a filter and as an adsorber. Some elements are held more firmly by the clay than others. Then, too, since the clay of our most productive soils is highly negative in its electrical charge, it necessarily holds chemical elements of the opposite or positive charge. But when hydrogen in the soil is also positive in charge, such as calcium in lime, potassium, or magnesium, we may well expect that the clay should be holding hydrogen or acidity as a non-nutrient along with these other elements which represent the fertility.

When carbonic acid is spending its soluble hydrogen or its acid in breaking down rocks to make their calcium, potassium and other elements soluble and available for plants, it should be no surprise to us that this mixture of positively charged elements, whether nutrient or not, should be caught up by and concentrated on the negatively charged clay. Can it not be readily appreciated then that acidity and fertility are therefore interchangeable and that any root growing into a soil center or spot

of fertility is also going into possible acidity?

Here then in these facts is a good foundation for our thinking about and understanding of the acidity-fertility situation in the soil. Acidity helps to develop a fertile soil under moderate rainfalls and stocks it with fertility, but under higher rainfalls this same acidity that puts nutrients on the clay can be excessive enough to take them off. Thus, when the soil has naturally become acid to a high degree, this condition merely means that the fertility has been removed to a dangerously large extent. In reality, it is then the starvation of the plant for nourishment in an acid soil rather than the excessive degree of acidity that makes what we call soil acidity, so troublesome in the growing of crops. It is not the arrival in the soil of the hydrogen or acidity, but rather the departure of the fertility that is the real trouble.

It is this interchangeability of acidity for fertility on the clay that makes possible the very feeding or nourishment of the plant by the soil. Experimental studies using the clay as a medium for growing plant roots have shown that the root gives off carbon dioxide and thereby surrounds itself with acidity from carbonic acid. This acidity then exchanges place on the clay with some of the nutrient elements like calcium, ammonium, magnesium and others, which are then free to move into the plant roots. It is by this trade of acidity to the soil that the plants are fed.

When limestone is put on the soil, it accepts acidity from the clay, just as other minerals do in the rock weathering processes. As a carbonate, it changes the active acid, or hydrogen, into water, of which compound the hydrogen is not such a highly active acid element. Therefore, the limestone corrects or neutralizes the soil acidity.

It has, however, been shown that this neutralizing effect from the liming operation is not so much the particular benefit derived by the crop, because compounds of calcium that do not neutralize the acidity, like calcium chloride, calcium sulfate or gypsum, and even ordinary cement for example, can improve the legume crop as well as calcium carbonate. Liming the soil puts calcium (or both calcium and magnesium if dolomitic limestone is used) on the clay, and thereby makes up this shortage on the list of nourishment of the crop. It feeds the plant this one nutrient which the better forage legumes need so badly for their good growth and which is so readily removed from soils under higher rainfalls. It is the calcium

put in, more than the acidity put out, that comes as the beneficial effect from liming the soil.

Experimental studies that provide accurate control of soil fertility, have demonstrated that the better legumes require large amounts of fertility in addition to nitrogen. Though they can take nitrogen from the free gaseous supply in the air, they do not carry on this special activity of cooperating with their nodule-producing bacteria unless the soil generously provides calcium, potassium, phosphorus, magnesium, and all the other strictly soil-borne or mineral nutrients. In spite of the fact that a legume may take much nitrogen from the air, it is equally true that usually more than half of the nitrogen content in such a legume is taken from the soil. Legumes are apt to be overrated in our belief that they can provide their necessary nitrogen wholly from the supply in the air. They are also perhaps generally overrated in our speaking of them so commonly as soil-builders. They are, however, better feeds because all the other elements of fertility besides nitrogen contribute much to make them so. These extras must be supplied through the soil.

It may seem unusual, yet very good yields and fine appearing crops of soybeans have been grown experimentally only to have less nitrogen, and thereby less protein, in the final crop (including both roots and tops) than was in the seeds originally planted. The reason for this was that the calcium supply in the soil was low. Nitrogen had gone from the crop to the soil rather than in the opposite direction, as is commonly expected. Deficient calcium in the soil was also the occasion for deficient phosphorus in the crop. Then, too, unless potassium was amply provided in the soil, this element, too, like the nitrogen and the phosphorus, was wandering in the wrong direction while the crop was growing. That the bulk of the crop should be increasing and the plants seemingly growing well while the final crop was containing less nitrogen, or less phophorus, or less potassium than was originally in the seed, may seem impossible, but such is what feeding results with animals seem to suggest.

Experiments at the Missouri Station, using different degrees of acidity, controlled in the soil, for soybeans, have shown more nitrogen taken from the air by this legume crop when the soil was acid and fertile, than when nearly neutral and of exactly the same fertility. Soybeans started in a soil at a high degree of acidity measured as pH 5.7, made that soil much more acid when they brought it to the pH 4.2 during

their growth. And yet in spite of that increase in acidity, they were taking nitrogen from the air amounting to as much as 25 per cent of the total in the crop. The comparison crop that started on nearly neutral soil of the same fertility also made its soil more acid, but it did not fix so much nitrogen from the air. Here, then, in these trials the legumes fixed more nitrogen, or would have been considered better soil builders, where the soil was left more acid but was given the fertility by calcium, phosphate, potassium and other nutrient elements. These legumes were tolerating acidity and functioned as nitrogen-fixers when given the necessary fertility.

Non-legume crops fit into the same category as legumes. They, too, have their troubles in growing on soils where there is increased acidity that means less fertility. They are not taking the mineral nutrients from the soil, nor are they synthesizing their complex compounds of such high food values, even though they may be producing bulk or tonnages per acre. For example, spinach, a non-legume, so often considered for the minerals it might put into the diet, contained less calcium and magnesium when grown on a neutral soil with ample fertility, than when the equivalent fertility was provided for the crop and the same soil left acid. In addition, the crop on the neutral soil contained more than enough oxalic acid to make all the calcium and magnesium it contained insoluble, and therefore indigestible. On the acid soil the crop contained more of these mineral nutrients than its oxalic acid contents would take out of digestive use.

Our troubles in growing legume crops have not been so much with the soil acidity itself. They have been rather with our measurements of the acidity, and our emphasis on it when we had no convenient and accurate enough means in the laboratory for observing and measuring the fertility. Now we have been shown that soil acidity is simply the indicator of the degree to which the clay must keep holding hydrogen, when there are not significant amounts of the elements of fertility to take its place. It is the acidity, or hydrogen, that has the highest activity in the soil of all the chemical elements. Without acidity there is less trading, or less business going on, in the soil. When all plants, both legumes and non-legumes, produce acid by which to feed themselves, shall we condemn this character by which they barter? It therefore behooves us to think about liming more as a provider of calcium for plant nourishment, than

as a carbonate to remove acidity. We should also provide other elements of fertility as well as calcium. With legume and non-legume crops, our acid soil trouble is not a question of their tolerating the acidity, but of our failure to appreciate that no plant can tolerate starvation. Yes, legumes can tolerate acidity if given fertility.

Mammoth or Medium Red Clover

Condensed from Iowa Farm Science

H. D. Hughes

MANY farmers apparently have a misconception about the difference between mammoth and medium red clover.

True mammoth clover, even under the most favorable seasonal conditions produces no stems, only basal leaves, the seeding year. It hardly ever grows taller than the height of the oat stubble the first season. Mammoth clover tends to produce root development rather than top growth in the seeding year. This root development is somewhat greater than that made by medium red clover.

In the second year, true mammoth clover reaches full bloom about 2 weeks later than medium red clover. It also makes a much more rank growth and is inclined to lodge rather badly. The stems of mammoth red clover are noticeably thicker and coarser than those of medium red clover.

Mammoth clover makes only one full crop in the second year. Such aftermath growth as occurs usually is not sufficient to justify harvest.

Experience has taught us that mammoth clover often will grow on soils where it is difficult to get a stand of red clover. A good example is sandy soil, which is inclined to dry out readily causing clover seedlings to die. This ability to make a successful stand under more difficult conditions has been attributed to the fact that mammoth clover uses its food materials for extending its root growth in the seeding year rather than for making top growth.

Medium red clover, unlike mammoth, generally make a fairly good top growth the year of seeding. In a favorable season, such as 1946, many seedlings will make a substantial growth their first year. They may even head

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and flower freely before the small grain shocks are out of the field.

By the end of a favorable season it is hard to tell these newly seeded fields from a second-year field of medium red clover. You have to walk into the field to discover the small grain stubble, entirely covered by a growth of 12 to 18 inches of clover. In such seasons it is not uncommon to harvest a seed crop in the fall from medium red clover seeded the previous April.

Medium red clover will make a large yield of hay in the early part of the second year. Then, unlike true mammoth clover, another crop comes on. This may be cut for hay, or it may be harvested for seed.

Wintering Beef Calves

If you are planning to winter beef calves for pasture fattening next summer, these Illinois tests will interest you.

Top winter ration has been one made up largely of corn silage. Calves weighing about 450 lbs. going into the winter have gained about 1.4 pounds a day on a daily feed averaging 22.6 pounds corn silage, 1 pound of soybean meal, 2.3 pounds legume hay, and .1 pound feeding limestone.

If you don't have enough silage for this method, another good ration is a full feed of good-quality legume hay, with 3 or 4 pounds of shelled corn a day. Feeding 8 to 10 pounds of hay and no supplement with the grain made the average daily gain about 1.25 pounds.

A third method, using roughage entirely, called for feeding all good - quality legume hay the calves would eat, and about 2 pounds a head a day of non-legume roughage, such as bright straw. The calves ate about 12 pounds of the legume hay a day, and gained between .8 and .9 pounds.

Keep Costs Low — Efficiency High

Condensed from American Poultry Journal

Eugene Spratt

THE "Glory" years of poultry raising, when a profit could be shown regardless of quality of product or cost of production, have ended. If the poultryman of today still wishes to be a poultryman tomorrow, he must depend on efficient low cost production and quality products to keep him in the business.

A Cornell University study of this problem demonstrated that the factors determining the profit or loss of a poultry farm could be divided generally into groups: (1) work units, a measure of size of the business; (2) eggs produced per layer, a measure of rate of production; and (3) work units per man, a measure of labor efficiency.

A work unit was defined by the Cornell workers as the average amount of directly productive work accomplished by a man in one 10-hour day. For example, it is figured that it requires an average of 20 days' labor to care for 100 hens in a year, thus 100 hens are considered to be 20 work units. The number of these units on the farm and the number handled per man are important factors in making a profitable enterprise of the poultry flock. This was demonstrated by the fact that an increase of 10 work units per man gave an average labor return increase of $69.

Size of business is important. By that, it is not meant that the farm must be large to make money, but rather that the amount of labor either hired or used for the poultry project should be well balanced so it is used to the greatest efficiency. In other words, each person working on the farm should have enough work units to keep him busy throughout the day, otherwise the cost of production rises. There are several things that will enable the poultryman to determine if his labor is being used efficiently: (1) layers per man; (2) dozens of eggs produced per man; (3) total income per man; and (4) the number of work units per man.

The number of layers per man will depend on each poultry farm and its equipment. The average time required per dozen eggs produced was found to be 9.5 minutes for light breeds and

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11.2 minutes for heavy breeds. In any case, the poultryman should use all the labor saving devices he can so each person working on the farm can handle as many layers as possible. The number of eggs produced per layer is determined to a large degree by the poultryman himself.

This factor will depend on quality of chicks raised,, amount of care and feeding that is applied, and the conditions under which the birds are kept. This is where good housing, clean and plentiful equipment, and good commercial or well supplemented home grown feeds will play an important part in helping to keep the poultry flocks on a profitable basis. It has been shown that for an average 1,000-egg increase, the labor income increased $68. In connection with this, too, an average of 6.9 lbs. of feed is consumed per dozen eggs for light breeds and 7.9 lbs. of feed for heavy breeds, showing the importance of good quality feeds.

Another factor that plays an important part in the success or failure of the poultry project is the mortality of both, young stock and older birds. Here good management is important, and a strict sanitation program will go far in helping to keep the birds free of disease and at high production levels. On the average farm with 25% mortality or less, they realized an income of $130 per year more than farms with more than 25% mortality. By controlling mites alone, farmers will be able to earn $36 more for every $100 invested; so mortality and disease control are important. In this coming period of close competition, any and all economy steps that can be taken will be of aid to poultrymen.

Efficiency Yields Production

Number of factors average or better	Farms	Work units	Factors: Eggs produced per layer	Work units per man	Labor income
	Number	Number	Number	Number	Dollars
None	17	292	144	158	−15
One	48	391	176	209	1,263
Two	41	865	161	288	2,343
Three	14	1,042	191	347	2,552
Total or average	120	594	168	257	1,601

This Farm Woods Earns Cash

Condensed from The Ohio Farmer

George E. Laycock

H. PALMER'S woods in Holmes County is one of the best examples of good woodlot management in Ohio. When the Ohio Division of Forestry began its program of establishing demonstration farm woodlots throughout the state it started with his woods.

This woodlot contains 42 acres, and has been scientifically managed for the past 35 years. That's as long as Palmer has owned it. Because he has kept livestock from his woods, and harvested only the "ripe" trees, it has paid off on a long term basis.

He has found that a crop of timber has some good points. One is that it runs little competition with other crops. Work on the woods can be planned when other jobs are the lightest. This crop doesn't ripen when the corn needs that third cultivating and the wheat needs cutting.

Palmer's first-rate woods covers good soil, which is both fertile and well drained. This land is capable of growing wheat or corn. He knows this, but he knows too that this 42-acre field is more valuable to him as a producer of quality timber. He didn't arrive at this decision after just one evening's figuring. It is the result of watching this forest grow year after year, constantly adding timber for farm uses and cash sales.

The primary species of trees in his woods are red and black oak, and tulip poplar. Some of the finest tulip poplar went to war as airplane veneer. Forty thousand board feet were logged from the woods, and brought him better than $2,000. Only the largest, best-shaped trees were harvested. Palmer hated to see these trees go but the price was right and the trees were ready for harvest.

Part of his success with his timber is founded upon his appreciation of a fine woods. He enjoys just having those trees growing on his farm. Beside that he has a good idea of what a farm woodlot can add to the total farm economy.

The first favor that he did his woods was to fence it from grazing livestock. In any woods this is the first requirement of good management. Harvested trees will be replaced by seedlings only

Reprinted by permission from the Ohio Farmer, Cleveland, Ohio, Oct. 19, 1946

if the woods is protected from trampling hooves and mowing teeth. When there are no seedlings to replace the old trees the woods is lost. The farm has lost its source of timber.

A second requirement for the farmer who wants a profitable farm woods is a short cutting cycle. Palmer's present plan is to harvest a crop of timber from his woods every five years. This can vary a few months if the price isn't right. Before a cutting is made Palmer goes into his woods and with the aid of the Ohio Division of Forestry, marks those trees that are ready to be cut. No others are removed, regardless of the price.

A short cutting cycle enables the owner to get the trees out when they have the highest value. The longer a mature tree is allowed to stand the greater are its its chances of becoming a victim of weather, insects, or lightning. The job of determining whether or not a tree is right for harvest is one for the timber marker.

The timber marker has a few fundamentals that guide him in his selection of marketable trees. First of all he looks at every tree that might be ready to go and tries to size it upon its individual merits. The size of the tree alone isn't enough evidence for the timber marker to determine its fate. He must also try to learn how much growth it is adding, and how healthy it is. If he is cutting on a five-year cycle he looks at each tree to determine whether or not it will stand for another five years despite blowing winds and heavy snows. Then he attempts to learn whether or not it has reached the limit of its growth.

When a tree hasn't reached its full size but lacks strength enough to stand for another five years it should be harvested, if there is enough good lumber in it to pay for the work of logging it. Some trees that have scars or other defects on the trunks will often grow out of these defects. if they have healthy crowns. These should be allowed another chance. One of the most wasteful timber practices is that of cutting trees on a diameter basis alone. The size of a tree doesn't always determine its value.

Palmer has learned all of these things and put them to practice. He has learned too that cull trees should be cleaned from the forest for they are a good source of firewood. In short he has learned how to utilize his farm woods for the greatest benefit to his farm.

Many farmers prefer to have the miller come into the woods and supervise the logging. Palmer prefers to do the work with his own men and equipment, and

supervise it personally. "I like to cut my own trees," he will tell you. He has learned through practice that this is the most profitable, when the farmer has enough machinery. This way the seedlings and saplings get better protection, and ONLY those trees he wants cut are removed.

Palmer, and other wise farm forest owners, seek out the aid of trained foresters in managing their woods. A farmer's nearest Division of Forestry field man can tell him all the technical things he needs to know about the care of his trees. He can tell him what trees to cut and how many board feet to cut each year. The amount to be cut is computed by determining the yearly growth of the whole forest and allowing that much to be harvested in mature trees. This helps make the woods a permanent producer.

Wet-Foot Legume

Big trefoil may be the answer to the South's need for a legume that will stand "wet feet."

A native of Europe, it is leafy, fine-stemmed, and resembles alfalfa. It has been grown commercially in western Oregon and Washington for several years. More recently it has been tried and has done well on low, wet pasture lands in the Southeast.

Big trefoil can be used for either hay or pasture. Stock like it either way. It is a long-lived perennial that is particularly well suited to grow with grasses. It grazes well in late summer when most pasture is short.

Right now seed is scarce. Engineers are still trying to find a practical way to harvest the seed. It is extremely small, and is carried in pods which burst open and scatter it when ripe.

Farm Journal

Reducing Cost of Milk Production

Condensed from Guernsey Breeder's Journal

H. A. Herman

Professor Dairy Husbandry, University of Missouri

DAIRY farmers can well afford to scrutinize the items making up the cost of milk production at this time. The relatively high prices paid for bulk milk, and often milk of cheese and condensery caliber have been particularly inducive to dairymen considering total production only. As a patriotic endeavor, and one to which the dairy industry responded whole-heartedly, this objective should not be criticized. To say it mildly, however, "the honeymoon is about over." Rising feed and labor costs and the fact that our exports of powdered milk, cheese, and butter will not continue indefinitely, should encourage every milk producer to appraise once again his herd and his methods of production.

The items of expense involved in the production of milk are feed, labor, investment in cattle and equipment, herd sire, depreciation, and miscellaneous costs such as light, water, testing, veterinary services, taxes, etc. Practices which increase the efficiency and economy of milk production are very important at all times but doubly so under present conditions. It is recognized that the cost of producing milk varies greatly from herd to herd and under different management conditions. The managerial ability of the operator, the level of production within his herd, feed supply, competency of labor and dozens of other factors fall into the category of practices which affect the cost of milk production.

The efficient dairyman is usually one whose herd produces milk and butter fat economically.

The interrelationship between the dairy enterprise and other farm enterprises, such as crop production, is often so involved that it is difficult to clearly separate the costs and practices involved in efficient milk production. Irrespective of these relationships, however, certain practices have become fixed for a successful dairy enterprise and even though they must necessarily be modified under certain conditions in their practical application, the end result obtained is the same. One must remember that agriculture is an art as well as a science and a business. Some timely points to be considered in low cost milk production are (1) efficient milk production by

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use of only cows carrying a high level of inheritance for production, (2) proper feeding, (3) maintenance of herd health, (4) regular calving interval, (5) economy in raising calves and young stock, (6) use of labor-saving devices and practices, and (7) production and wise marketing of quality milk.

The production obtained from a cow depends upon her inherited ability and her feeding and management. Invest feed and labor only in those cows with *inherited capacity for high production.* Poor producing cows may weigh the same, occupy just as much barn space and require as much labor as good producers. Bureau of Dairy Industry figures for 1942 reveal that cows tested in D.H.I.A. yielding 200 lbs. of fat annually returned about $57.00 above feed costs, while cows averaging 400 lbs. fat returned $151.00. The ideas and goals of the breeder are the most vital factors determining his ultimate success. Use only bulls from tested and proved families where it is demonstrated they are bred for high production, properly housed and handled to insure their long usefulness and safety to the operator.

Testing for milk and butter fat production is of paramount importance in this program. The man who follows a D.H.I.A. testing program and then also carries on Advanced Register, or Herd Improvement testing, is most likely to develop an efficient herd and also increase the value of his herd from a sales standpoint.

With beef prices favorable it is a good time to cull the poorest producers. This practice may appear to reduce total milk production but it seems reasonable to assume that a man can obtain the greatest net return, and the greatest total production if his limited feed and labor are expended on worthwhile cows. Few really good dairy cows are going to the stockyards.

Feed costs comprise 50 to 55 per cent of the total cost of milk production. Unless a cow is adequately fed, her inherited capacity is never fully utilized. A few good cows, well-fed, will require less labor and return more above feed costs than a large herd scantily fed.

Reducing feed costs through the use of plenty of good pastures, good roughages, and silage profitably and properly grown on the farm offers an opportunity for the dairyman to increase his total farm receipts by marketing his feed through good cows.

Failure to guard against and control Bang's disease, mastitis and breeding troubles results in lowered returns from the herd. Studies show that mastitis re-

duces milk yield 20 to 25 per cent, not to mention the discarding of milk which is unfit for sale. Likewise, herds severely infected with Bang's disease contain many cows producing some 25 per cent less milk as a result of abortion than where gestation and lactation are of the normal length. Regular routine testing of the herd for Bang's disease, frequent examination of the udders, and close attention to breeding failures are all very important in avoiding lowered efficiency in the herd.

The personal efforts and knowledge of a herd manager in observing and handling the animals in his care are often the difference between success and failure. The good herdsman is constantly on the lookout for such conditions as the cow off feed, showing a rough coat, failing in milk production, failing to settle, not chewing her cud, whose droppings are of the wrong consistency, bloated appearance, hard quarters, irregular breathing, physical injuries, signs of aborting, etc. Careful attention to these often neglected details may prevent a cow falling off in milk flow; it may even save her life, and above all it may result in timely isolation of the cow and prevent the spread of disease to the entire herd.

In an efficient herd the cows have an average calving interval of 12 to 13 months. Under practical conditions it is best to have the cow milk 10 to 10½ months, have a dry period of 6 to 8 weeks, and drop a calf annually.

Breeding troubles, and particularly trichomoniasis and vaginitis, cause great losses annually in milk yield. The keeping of complete breeding records, including heat dates and keeping on the alert for cows which return some 65 to 120 days after breeding, will aid in detecting these breeding troubles early, particularly so far as trichomoniasis and vaginitis are concerned. Many herdsmen are combating venereal diseases in their herds by breeding the cows artificially, after proper veterinary treatment, to a non-infected bull. The use of artificial breeding within a herd also enables the herdsman to locate the impotent bull quickly and retire him from service until he is fertile, thus saving much time which is often wasted by mating cows to a bull whose sperm—if any—are not capable of fertilization.

Only the best calves should be saved and raised according to a definite plan which stresses sanitation and efficient growth. Heifers should be grown out well and bred so as to calve at 24 to 28 months of age.

Under present conditions and in

times of milk scarcity and high prices for milk, calves may be raised successfully by feeding whole milk for a short time and gradually switching the calf to a dry grain mixture or calf starter. Much labor is saved by feeding the dry mixture. It is not necessary to have hot water at feeding time. There are no pails to wash after the first six weeks to two months and the danger of spreading disease is lessened. Under this plan the calf is fed whole milk for six to seven weeks. From the first week on the calf is induced to eat just as much concentrate mixture and leafy green hay as possible and the amount of whole milk is cut down gradually. A dry grain concentrate, containing a limited amount of skim-milk powder and other feed-stuffs, generally readily obtainable by the dairyman or obtainable in commercial calf starters, is suggested. Most Agricultural Colleges can supply full details concerning this plan. Missouri Agricultural Experiment Station Bulletin 377 — "Raising the Dairy Calf"—describes six plans for raising dairy calves. It may be obtained by writing to the Missouri College of Agriculture.

Heifers from 9 to 22 months of age may be very satisfactorily raised on hay, silage and pasture. By this plan one man can care for a large number of animals.

With a reduced labor supply the dairyman may greatly increase the output of his efforts by using labor saving machinery and practicing short cuts. Some labor saving devices are milking machines, water pumps, grain grinders, heavy duty sweep rakes, hay loaders, hay and grain elevators, etc. Likewise, short cuts in washing the separator, milking machine, etc., may be effected.

A study of the routine in doing chores, milking, etc., often points the way for saving many steps and much energy. A recent study reported by the Vermont Agricultural College illustrates the possibilities along this line in the case of Leonard Clark, Fletcher, Vt., who effected a saving of two hours and reduced his walking two miles daily in caring for his 22 cow herd. The changes made, after careful study, were relatively inexpensive and consisted of (1) rearrangement of barn, (2) improvement of work routines, (3) provision of adequate and suitable equipment, and (4) convenient location of tools, feed, supplies, etc.

Dairymen who are planning new dairy structures should plan them with the view in mind of cutting walking and lifting to a minimum.

The welfare of the dairy farmer and the growth of a sound industry is closely linked with good

quality in all dairy products. The successful and efficient marketing of milk is just as important a cog in the overall picture of successful dairying as feeding, building, disease control, etc.

Quality has been overlooked in some cases in the war years in order to keep total receipts at the processing and distributing plants at a high level. This is not going to continue—practically all dairy authorities unanimously agree that the *emphasis will be on quality in the post-war area.* This situation presents a most excellent opportunity for that dairyman who goes to the trouble of putting out top quality milk now, even though he may feel "that the other fellow is getting by with less."

The whole matter of reducing the cost of milk production calls for the best of planning on the part of the dairyman. It requires the type of thinking and sound building that makes better living conditions for the farm family. The dairy farmer who now will take the steps to insure his herd being made up of only high producing cows, controls disease, feeds properly, builds and arranges his set-up for the efficient use of labor, etc., will find himself prepared to better control, in a fair measure, his economic status in the years ahead. It is the only thing he can do for himself, prices, policies, subsidies, etc., are out of his hands as an individual. *He is the only man who can put into practice on his herd the steps which mean economical production.*

Fewer Pig Losses

High pig losses can, in many cases, be traced to a lack of vitamin A in the sow's ration, which weakens her and may mean smaller, weaker litters.

That's the conclusion of a special veterinary committee studying hog diseases.

Stillborn pigs are frequently a result. Newborn pigs may suffer from scours in the first four to six days, or pneumonia, because there is not enough vitamin A in the milk.

Hog raisers usually have more trouble with early-farrowed litters, because the sows haven't been on grass, one of the best vitamin A sources, or are on grain rations that don't include yellow corn. No other cereal contains much A.

Well-cured hay is a good source of the vitamin, as are corn gluten feed, corn gluten meal, and hominy feed.

Farm Journal

Nature's Mighty Plowman

Condensed from Frontiers

Henrietta Holland

AMONG lowly creatures, earthworms have lately come to be so highly regarded that man pampers them as he does his pets. Farms where earthworms are fed on balanced rations and given care such as cattle receive are part of the new economy.

The worm turns, says the proverb, and therein lies its value. Like miniature plowmen, they turn the soil and make it fertile. Earthworms have been performing this service almost since the world began, but it is only in recent times that man has paid serious attention to it, and it is only very recently that he has been raising domesticated earthworms.

The economic use of worms for bait is not new. In the Fifteenth Century, explicit directions for finding and using worms for bait were given by Juliana Berners, an English Benedictine nun, in her writings on outdoors subjects.

Observant farmers and fishermen digging for bait doubtless noticed that the most worms were found in moist, fertile soil, but on the whole earthworms were taken for granted and nobody suspected the extent of their place in nature. But in 1882 Charles Darwin wrote *The Formation of Vegetable Mould Through the Action of Earthworms*. In it he showed that with 53,000 worms in an acre, on the average, they can cover the surface with three inches of soil in fifteen years. He reported observing a field once strewn with stones that in thirty years was so thoroughly covered by worm castings that a horse could gallop across it without knocking a shoe against a rock.

This plowing is done when the earthworm comes to the surface tail first to deposit the earth that has passed through its food canal, as Sir J. Arthur Thompson so well explains. This means that in depositing the casting, the worm actually turns the earth, bringing up what was below and taking down what was on the surface.

The earthworm benefits the soil by a second method. Its foot-deep burrows admit air and assist weathering. They also admit water.

The earthworm's gizzard is one of the most efficient mills in the universe, grinding the soil and dissolving the mineral matter.

Reprinted by permission from Frontiers, Academy of Natural Sciences, Philadelphia, April, 1946

A third service performed by these members of the *Oligochaeta (oligio* — few; *chaeta* — *bristles)* consists of dragging leaves into their burrows and digesting them.

Darwin concluded: "It may be doubted whether there are many other animals which have played so important a part in the history of the world as have these lowly organized creatures."

Dr. George Sheffield Oliver is said to have been first in developing domestic earthworms with characteristics suitable for agricultural purposes. It was his idea to raise worms specifically for planting in the soil.

As his assistant, Dr. Oliver had a young woman social worker who had been forced by illness to give up her job. During her convalescence she became so fascinated by earthworms that she decided to take up the problems of worms in place of the problems of human beings. When Dr. Oliver retired in 1940, Mary Leasure took over his work. Today she is rated our Number One earthworm farmer, directing the production and world-wide distribution of earthworms.

The farm, at Ontario, California, is as neat and orderly as any you could find anywhere. From the street the only sign of worms is a placard, reading "California Earthworm Farms." but the farm itself has been especially adapted to the needs and conveniences of worms.

Here are large culture beds, three feet wide, two feet deep, and six feet long, each holding about twenty-seven cubic feet of soil kept at the proper temperature and degree of moisture to insure the health of the worms.

The worms are fed a vitamin-rich diet of leaves, straw, manure, lawn clippings and weeds. For minerals, natural rock phosphate is added. Cottonseed, linseed, alfalfa or walnut meal provide extra calories, and coffee grounds, nuts and shells are included for variety.

From 27,000 to 50,000 earthworms inhabit each bed. When they are just the proper age for garden work (usually two or three months old), they are taken from these beds and carefully packed for shipment to farmers in the United States and abroad. The worms are packed in soil and peat moss in cartons holding from half a pint to a gallon. With each carton Miss Leasure packs a "Worm-o-Gram" of advice, and the worms are sent on their way to help make America's good earth better.

Because earthworms work up and down, burrowing and tunneling, farmers prize them. They can cultivate the top soil much more efficiently than any plow. They literaly eat the soil, digesting the organic matter and even

pebbles in their gizzard-like apparatus and excreting it in the form of fine, rich soil.

Earthworms reproduce in an unusual manner. The sexes are combined in each individual, yet the eggs of one are fertilized by another. As the anterior ends come together, a mucous ring forms around the bodies near the flesh-colored, swollen band. Several eggs are deposited in this ring, which also contains albuminous matter to nourish the embryo worms. After formation, the mucous ring quickly solidifies and is slipped over the head of the worms in the form of a capsule. After a three-weeks' incubation period, the worms emerge from the capsule fully formed and ready to begin eating soil.

It has been found that in alien soil, infant worms hatched from capsules make a better adjustment than adult worms. Most farmers buy adult worms, but some, especially those who live at great distances or in foreign lands, buy capsules and plant them in their soil.

Worm population varies with the soil. The Oregon Agricultural Experiment Station reported finding only 250,000 worms an acre in silty clay loam from which Douglas Fir had been cut, whereas there were twice as many in Williamette silty clay loam under soft maples, and about a million and a half in an acre of newly-cultivated soil which had been manured the year before.

Earthworms have no eyes or ears, yet they appear sensitive to light and sound. The area of greatest sensitivity seems to be in the forward end of the body. W. R. Walton reports that they are comparatively insensitive to red light but are strongly affected by blue. They apparently can register vibrations. During a high wind they usually go underground.

Instinctively earthworms seem to know the most efficient method of handling material and of taking care of themselves. They line their burrows and close the entrance with leaves and other materials. They have no teeth or biting equipment, but they can eat amazing food—straw, coffee grounds, shells, leaves. They simply suck in their food, to be cared for by a gizzard-like digestive tract. If the worms find food that is too large or too tough, they moisten it with a secretion from their mouths which causes the food to ferment. Even with such rudimentary mouth organs, earthworms can make audible sounds which are best described by moistening the lips and smacking them together very softly.

Earthworms are efficient travelers. The rings of their bodies have muscles which they alternately expand and contract to

move them along, using the bristles on the sides of their bodies for pushers.

Most earthworms live in the soil, although some live only in the water, while others live either on land or in water. In Africa, Ceylon and Australia are giant earthworms three to nine feet long.

Earthworms are known by a variety of names. In Utah they are dew worms; in Connecticut, eel worms; in Boston, garden worms; in New Hampshire, mud worms; in Pennsylvania, rain worms; and in the West, angle worms or fishing worms. Boys of Washington, D. C., call them night lions, night-walkers, or night prowlers.

Night prowler is appropriate, for the Oligochaetes are nocturnal. Naturalists sometimes turn flashlights on their lawns to show unbelieving guests how many earthworms are active on the surface, searching for bits of plants and vegetable refuse to drag below.

Skim Milk Important in Keeping Pigs Free of Worms

Skim milk in the ration of growing pigs has a double value. Swine producers have long recognized that skim milk fed pigs do better than others even though other generally considered satisfactory protein supplements are fed.

A part of this better result obtained on skim milk may be due to its value in keeping growing pigs free of intestinal and stomach worms especially where the pigs being fed are raised on old pastures and lots.

In tests conducted by the U. S. Bureau of Animal Industry pigs were kept under conditions favoring the acquiring of large numbers of intestional parasites. Those that were fed skim milk and whey escaped significant traces of stomach worms, ascarids, nodular worms, and whipworms, while those which were fed only a balanced ration, but without these dairy products, became heavily infested.

Am. Hampshire Herdsman

Breeding Season Management

Condensed from American Hampshire Herdsman

Harold Boucher

THE foundation of a successful breeding program is the herd boar. Considerable time and money go into the selection of new herd sires but these things alone will not bring success to a breeding program.

An outstanding boar deserves the same kind of care and management that was used in his selection. Good breeding and a fancy price paid for a herd boar will not insure a top pig crop. These are the first essentials but such a boar must be given ample opportunity to demonstrate his value. This calls for good care and management.

Common observation indicates that the boar is one of the most commonly neglected farm animals. In far too many cases herd boar care and management is still in the pig-sty stage. A dark stall in the barn, or a six by eight pen built behind the barn with one corner covered is often the only shelter and range allowed. Feed may consist of a couple of ears of corn a day and water given once a day. In such instances, exercise is limited to ranting around this too small enclosure and a club is frequently used in handling the boar at breeding time. These quarters used over a period of time soon become filthy and unsanitary. The new boar placed in such quarters soon looks the part of his environment. The success obtained by these breeders is usually in keeping with such methods.

Many things enter into the care and management of the herd boar. Each boar presents a definite problem, therefore, it is impossible to set up a definite set of rules for the boar's care. However, there are certain general practices that if followed with good common sense will obtain satisfactory results. Good care of the boar calls for plenty of exercise, proper feeding, good shelter and careful handling.

To avoid such situations as those mentioned above the breeder could well afford to plan a system of boar lots, which will enable him to have a good sized place for the boar to run at all times, away from the sows, and at the same time be convenient so as to save time and labor and

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also provide green pasture a high per cent of the time. Such lots could be rotated to insure sanitation, to secure other uses of them, and to provide ample green pasturage. A variety of pasture crops can be used to secure green forage. Early sown rye is an excellent source of green feed for the fall breeding season. A sufficiently large pasture is not only an excellent means of securing plenty of exercise but is the cheapest source of feed available.

In feeding the boar it is desirable that he be in a gaining state at the beginning of the breeding season. He doesn't want to be gotten in too high condition, so that he becomes inactive and his breeding impaired. The ideal condition is one where the boar can be used heavily and at the same time maintain his weight. The young boar should be kept growing This requires a liberal ration which will supply plenty of protein, minerals and vitamins. If these essentials of the ration are provided a variety of feeds may be used to make up the ration with good results. Overfeeding should be avoided as it is the quickest way to throw a boar off feed. Placing a young boar with an older boar or a barrow with a young boar is often helpful in getting a boar to eat and in keeping him from ranting.

Shelter for the boar should be dry, comfortable, well ventilated, warm in the winter and cool in the summer. The door to the boar's quarters should be high enough so that he can enter without rubbing his back. This means that when the house is made, the door should be made large enough to accommodate a mature boar. Liberal use should be made of bedding and it should be changed often.

With plenty of patience and close observation a boar can be readily and easily trained. The first step is to acquire his confidence. The young boar should be broke to a crate. If he proves a valuable sire he should be continued in service. If he is crate-broken, maximum use can be made of his siring ability. The breeding crate should be put in good repair before attempting to use it. With a young boar it is essential that his first service be successful. Some breeders bring the sow to the boar's pen and others use a regular breeding pen to which both the sow and boar are brought. Either way is satisfactory. Hand mating is to be recommended in all herds. With hand mating, good handling and proper feed, the maximum number of sows can be bred during a breeding season. A yearling or older boar properly handled should breed two sows a day and occasionally three. A well grown

junior boar should breed one sow a day and occasionally two. When a boar's breeding schedule is a heavy one, every effort should be made to time the services so that a reasonable time intervenes between them. When two sows are to be bred the same day, one should be bred in the morning and the other in the evening and in all instances before feeding the boar. One good service should be sufficient. However, in recent experimental tests two breedings in one heat settled 90 per cent of the sows bred as compared to 72 per cent settled by one breeding. Where the number of sows to be bred is such that two breedings will not overtax the boar there is much to gain and nothing to lose by permitting the boar to serve the sow twice. The ideal time for breeding is the last part of the heat period.

In handling the sows at breeding time, it is important that the sows be fed so as to have them in a gaining condition at breeding time This will result in a maximum production of female germ cells which is important to good litter size. Sows when gaining in flesh and thrift also tend to come in heat promptly and to be more apt to settle when bred. Close observation of the sow herd should be made during the breeding season in order to be sure to catch the sows when in heat. After a sow has been bred she should be placed to herself until heat has passed.

In addition to good feeding, which will provide plenty of protein, mineral and vitamin the sow herd should be kept in a dry, well ventilated place. Gilts allowed to sleep in quarters that are drafty, are likely to contract the flu and considerable trouble will be had in getting them settled.

Good feeding, good housing and good care of both the sow herd and the herd boar during, and immediately preceding, the breeding season will greatly affect the results obtained at farrowing time. The successful breeder will prepare now to achieve maximum results next spring.

Sulfamerazine Successfully Controls Coccidiosis in Trials with Chickens

Condensed from Science for the Farmer

W. T. S. Thorp

CERTAIN sulfonamides show great promise as means of preventing as well as treating cecal coccidiosis in chickens. If these chemicals prove as useful in general application as they have in clinical tests, and in preliminary trials by practicing veterinarians, poultrymen will find them very useful in controlling the disease.

Many sulfonamides tried by other investigators have been found to act favorably against the organism causing coccidiosis, *Eimeria tenella.* All are poison, however, and must be carefully applied.

Sulfamerazine and sodium sulfamerazine (Sulfowl) produced very desirable results in trials at this Station during the past year. One thousand 4-week-old chickens were involved in six tests of these chemicals at various concentrations. Determination of a suitable dosage was found very important, and proper dosage will have to be borne in mind when treating flocks.

A two-tenths of one per cent sodium sulfamerazine drinking water solution, given when the first symptoms of cecal coccidiosis appeared, reduced the mortality rate from 9 to 1-to-3 out of 20 birds in a typical experiment involving 5 pens of 20 chickens each. Similarly half of one per cent sulfamerazine mash fed from the time first symptoms appeared prevented all death loss in 4 out of 5 pens of 20 chickens, while 12 birds died in the pen which received no treatment.

All of these chicks were inoculated with the organism causing cecal coccidiosis, *Emeria tenella,* to produce the disease. The half of one per cent sulfamerazine mash treatment was so successful that it will be tested in future trials.

Under field conditions where the two-tenths of one per cent sodium sulfamerazine drinking water solution was given at the appearance of symptoms of coccidiosis, death loss was decidedly reduced. Results with this solution were very satisfactory in controlling outbreaks.

Reprinted by permission from Science for the Farmer, Sept., 1946
Penna. State Agricultural Experiment Station, State College, Pa.

The two-tenths of one per cent sodium sulfamerazine drinking water and .25 of one per cent sulfamerazine mash seemed to prevent outbreaks of coccidiosis. The chemical did not produce immunity to the disease, but the mild form which developed may have resulted in immunity. The use of one per cent sulfamerazine mash, the strongest concentration tried, reduced average weight gains of the chicks, suggesting toxic effects.

Weight gains were not reduced by the two-tenths of one per cent sodium sulfamerazine drinking water or by half of one per cent sulfamerazine mash; in fact, in these tests weight gains were definitely improved. There was definite evidence that weight gains were reduced by coccidiosis, even in those birds which survived the infection.

(Safe dosages of sulfamerazine for turkey poults have not yet been determined.)

Wool-Tested Rams

How would you like to know, when you bought a stud ram, how heavy a fleece you could expect him to grow?

New Mexico sheep men bought rams that way at their recent state sale, and they liked it.

The eight stud rams offered were run into the ring, and buyers got a chance to see them with their wool on. Then, right there, the rams were sheared, the wool weighed, and the shrink estimated. Only then were the rams sold.

The top ram ($400) had a 21-month fleece that weighed 47 pounds.

Buyers of range rams also got an idea of what they could expect. Six months before the sale State College animal husbandmen went through the bands having rams that were to be consigned. These rams were clipped on one hip. Then before the sale the new wool growth was measured, and figured to a twelve-month basis. The rams whose wool made the best growth brought the most.

Farm Journal

Fermate to Control Blue Mold

Condensed from The Southern Planter

S. B. Fenne

Extension Plant Pathologist, V. P. I.

DURING 1946 about half of all the tobacco farmers in Virginia sprayed their plant beds with Fermate. Eighty-five demonstrations were conducted by county agents in an attempt to familiarize farmers with spraying and dusting.

Practically all of the demonstrators reported satisfaction with the treatment. Most of them stated that Fermate was more effective than any material they had ever used. They considered the treatment practical and simple to use. About 90 per cent of the demonstrators thought that Fermate stimulated plant growth in addition to controlling the disease. Some stated that the treated plants grew faster, were greener and stockier than untreated ones; also, that the Fermate treatment seemed to help the plants after they were set in the field.

Even though there were frequent rains during the plant bed season, which greatly interfered with the spray applications, satisfactory results were reported. There was some blue mold in most of the treated beds, but it caused little damage. Many unsprayed beds were a complete loss and in practically all other cases, transplanting was delayed about two weeks and only about 65 per cent as many plants were obtained.

Fermate may be used either as a spray or as a dust. It is a protective material and, therefore, must be applied to the plants in advance of appearance of blue mold. The number of applications required for the control of this disease will vary with the season. The first application should be made when the plants begin to "square," or when they are about the size of a dime. Apply Fermate regularly twice each week until the plants are set in the field. Eight to 122 applications will probably be required. If a rain occurs and washes off the material, another application should be made as soon as the rain stops.

Two and one-half pounds of Fermate is enough to treat 100 square yards for the season. When the plants are small, 2½ gallons of spray for each application is sufficient to cover 100

Reprinted from the Southern Planter, Richmond, Virginia, Nov., 1946

square yards of plant bed. For larger plants 7 to 8 gallons may be needed.

Prepare this spray by mixing the Fermate powder in water at the rate of 5 level tablespoons (½ oz.) to each gallon of water. Only enough material for one application should be made up at a time. Put the powder in a jar and fill it halffull of water. Place the lid on tightly and shake vigorously until the Fermate and water are thoroughly mixed. Then pour this mixture into the proper amount of water. Keep the mixture thoroughly agitated while spraying. If blue mold appears in the plant bed, increase the amount of Fermate used to about 7 or 8 tablespoons per gallon.

A bucket or wheelbarrow-type sprayer is best. However, a small 3-gallon compressed air sprayer will be satisfactory for small beds. Keep the spray nozzle one to two feet above the plants and move it back and forth until black spray droplets appear on all the leaves. Small plants may be sprayed through the plant bed cloth if a high-pressure barrel pump is used, and if the cover is stretched at least 6 inches above the plants.

Some growers prefer to use Fermate as a dust, because of the greater convenience and ease of application. A 15 per cent Fermate dust may be purchased ready-mixed or it may be mixed on the farm if directions are carefully followed. The material must be thoroughly mixed.

Dust treatments, like the spray treatments, should begin before blue mold appears, and repeated twice each week or after each rain. If blue mold appears in the plant bed, increase the rate and make 3 applications instead of 2 that week. Approximately 30 pounds of mixed dust should be sufficient to treat a 100 square yards of bed for the season. About 1 pound of dust will be required for each application when the plants are small. It will require 2 or 3 pounds per 100 square yards later in the season. The cost will be about twice that of spraying.

To mix your own Fermate dust on the farm, put 7½ pounds of Fermate and 4½ pounds of Pyrox (pyrophyllite), or other suitable inert material (do not use lime), into a tight barrel or drum (a 10-gallon milk can will be satisfactory for small quantities), then roll the barrel around for about five minutes or until the dust is thoroughly mixed, and uniform in color. A dozen small stones the size of hen eggs, placed in the barrel, will help mix the dust more quickly.

Use a good crank-type duster. When the plants are small, dust through the cloth. For best re-

sults, the clover should be several inches above the plants and completely dry. It is impossible to dust properly a bed over 4 yards wide without removing the cover. All plants must be uniformly covered with the dust at each application.

DDT may be added to the Fermate spray for controlling flea beetles, using 2 level tablespoons of the 50 per cent table powder to each gallon. Or if a dust is preferred, use a 3 per cent DDT dust mixture. Usually 1 or 2 applications with DDT early in the season and 1 application just before pulling the plants will be sufficient.

You Should Get 204 Eggs a Year

Condensed from New Jersey Farm and Garden

C. S. Platt

Are you getting an average of 204 eggs per bird? If not, you should investigate your breeding, feeding, and general management. Lower production indicates that something is wrong somewhere along the line, as judged by the average production of all of the birds of all breeds at the 1945-46 New Jersey flock mating contest. Production was 204.1 eggs per bird, with a profit of $3.45 over feed cost. Certainly no one should be satisfied nowadays with a production less than this average, and with proper breeding and management, you have a right to expect more

How more eggs reduce feed cost is illustrated by the three high pens in this contest which averaged 230.8, 228.8, and 225.3 eggs per bird entered, with returns over feed cost of $4.44, $4.32 and $4.22. So, you see, those extra eggs laid by the highest pen brought almost a dollar extra profit per bird over the $3.45 which was the contest average. All birds in this particular contest are selected from regular commercial flocks, hence set standards that any commercial egg producer should be able to duplicate.

New Jersey Farm and Garden

Reprinted by permission from N. J. Farm and Garden, Sea Isle City, N. J., Nov., 1946

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. $2.25.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $3.50.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers. $2.50.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.50.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. By R. W. Gregory. J. B. Lippincott Co. $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D. V. M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition. $3.75.

Farmers of the World—The Development of Agri. Extension—edited by Edmund deS. Brunner, I. T. Sanders, Douglas Ensminger. Columbia Univ. Press (1945). $2.50.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.50.

Farm Records—by John A. Hopkins, Ph.D., Asso. Prof. Economics, Iowa State College. Iowa State College Press. $3.00.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. $3.50.

Grow Your Own Fruit—By M. G. Kains, formerly U. S. Dept. of Agri.; Prof. of Horticulture, Penna. State College. Greenberg, Publisher. $3.50.

Hatchery Management—By Roland C. Hartman, Editor, Everybody's Poultry Magazine, and G. S. Vickers, Field Mgr., Ohio Poultry Improvement Asso. Orange Judd Publishing Co., Inc. $4.00.

How to Raise Rabbits for Food and Fur—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $3.00.

Livestock Production—By Walter H. Peters, Chief, Div. of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $4.00.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The interstate Printers. $3.25.

Making Pigeons Pay—By Wendell M. Levi, formerly Pigeon Section, U.S.D.A. Signal Corps. Orange Judd Publishing Co., Inc. (1946). $2.50

Modern Agricultural Mathematics—By Maurice Nadler, B. S., A. M., Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., formerly U. S. Dept. of Agri. Orange Judd Pub. Co., Inc. $4.50.

Natural Principles of Land Use—By Edw. H. Graham, Chief of Biology Div., Soil Conservation Service. Oxford University Press. $3.50.

Onion Production—By Donald Comin, Ass't Horticulturist, Ohio State Exp. Station. Orange Judd Publishing Co., Inc. (1946). $2.00.

Pay Dirt—Farming and Gardening with Composts — By J. I. Rodale. Devin-Adair Co. (1945). $3.00.

Pork Production — By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $4.15.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry. Mo. State Univ. J. B. Lippincott Co. $5.00.

Practical Farming for the South — By Benjamin F. Bullock, now Prof. Rural Education, Atlanta Univ. Univ. of North Carolina Press. $2.50.

Profitable Poultry Keeping—By H. Clyde Knandel, Head, Dept. Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue Univ. The Interstate Printers & Publishers. $2.25.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.50.

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Dept. of Agric. McGraw-Hill Book Co., Inc. $6.50.

Starting Right with Turkeys—By G. T. Klein, Extension Poultryman, Mass. State College; edited by Ed. Robinson. The Macmillan Co. (1946). $2.50.

Successful Poultry Management—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.50.

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BOOKS OF INTEREST

AMERICA'S GARDEN BOOK — By Louise Bush-Brown, Director of the School of Horticulture, and James Bush-Brown, Landscape Architect.

This is a refreshingly practical and comprehensive volume. It tells the whole story of garden processes in smallest possible compass, without being elementary or incomplete. The thirty-four chapters present all possible topics in gardening, and include such timely subjects as Soil and Soil Improvement, Lawns, The Home Fruit Garden, The Home Vegetable Garden, Coldframes and Hotbeds, House Plants, Diseases and Insect Pests, Ornamental and Woodland Gardens.

Publishers: Charles Scribner's Sons, $3.50

PLEASANT VALLEY—By Louis Bromfield, farmer, soil conservationist, and author.

This appealing and delightful book is written for everyone—city-dweller or country man. It is an engaging account of the author's experiences as a farmer in his native Ohio, telling the story of the land and people who are closest to him.

Publishers: Harper & Brothers, $3.00

THE FARM PRIMER—By Walter Magnus Teller, formerly with the FSA, United States Department of Agriculture.

This is a practical manual, handbook, and reference book for the beginner and part-time farmer.

Publisher: David McKay Company, $2.50

SUCCESS ON THE SMALL FARM—By Haydn S. Pearson, author of "Country Flavor."

This book offers a specific and practical program for making a profit from a one-man farm of ten or twelve acres. It is addressed to the beginner with limited capital who must make a safe and efficient start. Established farmers will find much valuable information and sound advice in this book.

Publisher: McGraw-Hill Book Company, Inc., $2.50

THE AMERICAN LAND—ITS HISTORY AND ITS USES—By William R. Van-Dersal, biologist in the United States Department of Agriculture.

What America was in the beginning, what American land is now, and an inkling of what it may be in the future form the subject of this interesting book. It comes as a timely contribution in an era when Americans are rediscovering the American soil.

Publishers: Oxford University Press, $3.75

Keeping Christmas

Are you willing to forget what you have done for other people, and to remember what other people have done for you; to ignore what the world owes you, and to think what you owe the world; to put your rights in the background, and your duties in the middle distance, and your chances to do a little more than your duty in the foreground; to see that your fellowmen are just as real as you are, and try to look behind their faces to their hearts, hungry for joy; to own that probably the only good reason for your existence is not what you are going to get out of life, but what you are going to give life; to look around you for a place where you can sow a few seeds of happiness—are you willing to do these things even for a day? Then you can keep Christmas!

Henry Van Dyke